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THE BRICKBVILDER

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THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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EXTENSION OF BOSTON FIRE LIMITS.

THE city of Boston has been on the whole quite fortunate in regard to its building ordinances; which, with very few exceptions have been drawn up under expert advice, and in some cases were directly prepared by some of the best architects and builders in the city. Alterations of these ordinances have in general been pretty carefully considered by experts before being presented to the legislature; but opposition which such well-considered improvements of existing laws invariably encounter at the hands of politicians and selfish property owners is of course not peculiar to Boston, but is a condition which our city shares with every large municipality, and the latest proposed change has come in for its full share of unreasoning, selfish opposition. As the laws at present stand, the so-called down-town district, including all of the business portion of the city, and a considerable portion of what is known as the Back Bay, which is now residential, but which is rapidly becoming a business section, is restricted so that no wooden structure except wharves, etc., can be built therein. It has now been proposed to extend the so-called fire limits so as to include a very considerable portion of Roxbury and Charlestown immediately adjoining on the south and north. The change in the law apparently comes at the suggestion of the underwriters, and of those who have the best interest of the city as a whole at heart; and it is an improvement which appears to be supported by the best architects and builders as well as by the majority of the building inspectors, but it seems to encounter a very unanimous opposition on the part of all real-estate owners and operators. The proposed changes, if put into effect, would, in general, prohibit the erection of wooden buildings of any description throughout the whole of the city proper, and a considerable portion of the suburbs, and it is this prohibition which seems to be viewed by the real-estate people as unnecessary, tending to reduce the valuation of the city of Boston, and as a usurpation of the people's rights.

It is taking long generations for this country to appreciate the innate wastefulness of cheap construction, and the traditions of wooden dwellings have been so rooted in our ideas of constructive possibilities that it requires a very determined effort to overcome the kind of arguments which are put forward against such a bill as has just been described. The dangers to a city from the closely contiguous suburban district built up of inflammable construction have been demonstrated so often, and the results of such conflagrations as will arise from time to time in a wooden district are so tremendous, that it would have seemed to be unnecessary to urge the adoption of more restrictive methods. Indeed, we believe that the principal remonstrants to this bill were actuated more by an unwillingness to add any restrictions whatever to their individual plots of land than by any conviction that the proposed law would not in the long run prove an advantage to the city as a whole. And however strongly opponents might argue against brick structures for other people, we have no doubt that if a personal matter were made of it, they would much prefer to live in a residential quarter built up of properly designed masonry houses than to live even upon the borders of a wooden house district. The argument that wooden houses are cheaper than brick ought not to count at all in the consideration of this proposed law. There are very few large cities that are not already possessed of far too many cheap houses, and if a low expense is to be considered, it can be shown by a very simple computation that, taken through a course of twenty-five or thirty years, a well-built brick house is cheaper, costs less money, and will rent for more than one built following the ordinary methods of wooden construction. If we are to have inexpensive residences, they can be built as a more permanent investment, will yield in the long run a better return on the capital, and can be made in every respect more habitable if properly constructed of brick than if of any other material, while the saving in insurance rates and the indirect saving in the exemption from large conflagrations, ought to be considered as of so much public value that private desire for exemption from restrictions would not weigh at all. There seems to be an unfortunate idea that a brick house can only be built as one of a block, that if we are not to build wooden houses we must perforce build long, dreary blocks of brick structures. If this were the inevitable consequence of the extension of this law it would certainly be deplorable; but we believe if such a law were to go into effect, we would see quite as many isolated houses, the city would have more real value, and so far from the houses being more congregated, we believe there would be quite as much isolated construction, and probably more, for in the same districts, given a necessity for a slightly more expensive construction in the first cost, the probabilities are that such structures as are put up would be owned by those who could afford more land around their houses. It seems to us there is every reason for, and no fair, valid reason against, the reasonable extension of the limits wherein nothing but masonry structures should be permitted, and this condition applies to every city in this country.

At one of the hearings on the opposed bill a suggestion was made by Mr. William Atkinson, an architect of this city, which as a compromise measure is certainly deserving of careful consideration. Recognizing the reluctance of property owners to yield to limitations upon their property, he suggests that the act be in such form that structures of wood must be separated from each other by a considerable distance, not less than twenty feet, so that the conflagration of large blocks of wooden structures can be avoided, and the fire loss correspondingly diminished. Mr. Atkinson expressed a belief that under such a law as this the property owners would find it cheaper to build of brick and cover more of their land, and that the final result of this law would be in time the same as if nothing but brick were to be allowed. This amendment is a good one, though we feel that the quicker a great city can arrive at a basis of reliable, fairly fire-retarding construction, the better it will be for both the individual property owner and the city at large.

A FIRE occurred at night, April 2, in the new building of the American Soda Fountain Company, 278 Congress Street, Boston. The night watchman, in going his rounds, noticed that a sprinkler had opened, and, being entirely ignorant of the fire, rushed to section valve on first floor and closed it. The sprinkler alarm was ringing but was unheard by the watchman, it being located in a closed room on the first floor. The floors were constructed of concrete, and supposed to be waterproof, but allowed the water to run through and caused damage to be done to four stories. The action of lime (in concrete) with water passing through caused silver-plated ware to be turned black, necessitating replating and polishing.

THE American Institute of Architects has leased the Octagon House, perhaps better known as the "Tayloe Mansion," Washington, D. C., as a permanent home for the Institute. The building is an interesting specimen of brick colonial architecture, both in its detail and well-studied plan. A committee has been appointed to put the building in thorough repair and make needed alterations. It will in the future serve as the regular gathering place for annual conventions.

THE New York chapter of the American Institute of Architects has submitted the following names to Mayor Van Wyck for appointment on the commission to formulate a new building code for Greater New York: George B. Post, Louis de Coppet Berg, Cyrus L. W. Eidlitz, L. F. J. Weir, R. W. Gibson, and George Keister.

THE Thirty-second Annual Convention of the American Institute of Architects is to be held in Washington, D. C., on Tuesday, Wednesday, and Thursday, November 1, 2, and 3. The local committee of arrangements consists of Messrs. Glenn Brown, Robert Stead, and Edward Donn, Jr., all of Washington.

THE Rotch Scholarship for 1898 has been awarded to Mr. L. C. Newhall, of Malden, Mass., a draughtsman in the office of Mr. Arthur H. Bowditch, of Boston. Mr. Newhall is the fifteenth holder of the scholarship.

NEW YORK insurance companies are willing to insure the new thirty-two story fire-proof syndicate building on Park Row, New York City, for $675,000, for five years, at a total premium of $675.

THE vacation traveling scholarship, instituted a year ago by the Boston Architectural Club, has been awarded for the present year to Mr. Albert C. Fernald.

THE new building ordinance of Chicago limits the heights of buildings to ten stories and 130 ft.

PERSONAL AND CLUB NEWS.

W. DOUGLAS HILL, architect, has removed from Pottsville, Pa., to Newport News, Va.

H. A. BETTS, architect, Milwaukee, Wis., has removed his office from the Goldsmith Building to the Colby & Abbott Building.

CHARLES E. DAWLEY, architect, has opened offices in the Bushnell Building, Springfield, Ohio.

THE Tenth Annual Exhibition of the work of the pupils of the Detroit Museum Art School was held in the east gallery of the Detroit Museum of Art from June 1 to 5.

THE WASHINGTON ARCHITECTURAL CLUB held its annual meeting Saturday, June 4, and elected the following officers for the ensuing year: President, Edward W. Donn; secretary, Arthur B. Heaton; treasurer, W. D. Windom; directors for two years, T. F. Laist and W. J. Marsh; for one year (to fill unexpired term) T. J. D. Fuller.

After the election, the constitution of the Fine Arts Society of the District of Columbia was accepted and the following delegates to that body were elected: T. F. Laist, W. D. Wood, T. J. D. Fuller; and as alternates, W. D. Windom, P. C. Adams, and E. R. Crane. Frank Upman and Harry Dodge Jenkins, of the Chicago Architectural Club, were admitted to membership.

ILLUSTRATED ADVERTISEMENTS.

THE accompanying illustration, representing the "Good Samaritan," is a panel in terra-cotta executed by the New York Architectural Terra-Cotta Company.

Number twelve of the series of "Brick and Terra-Cotta Fireplace Mantels," of which J. H. Ritchie is the designer, is illustrated in the advertisement of Fiske, Homes & Co., page vii.

The residence of James G. Pontefract, Esq., at Allegheny, Pa., of which Longfellow, Alden & Harlow were the architects, is illustrated in the advertisement of the Harbison & Walker Company, page xv.

A staircase (Guastavino construction) in the open shaft of an eight-story hotel is shown in the advertisement of R. Guastavino Company, page xx.

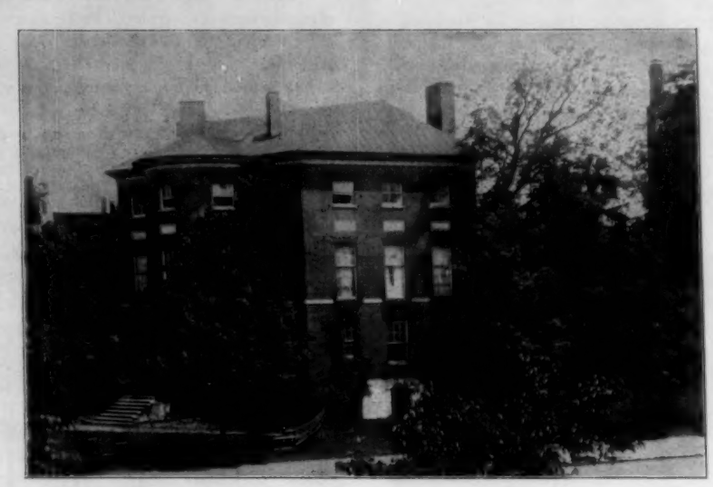
Two views of the plant of the Celadon Terra-Cotta Company, at Alfred, N. Y., one of the factory in 1888, and the other of the plant as it is to-day, are shown in the company's advertisement on page xxvii.

PLATE ILLUSTRATIONS.

PLATES 41 and 42. Phillips Brooks House, Harvard College, Cambridge, Mass., A. W. Longfellow, Jr., architect. After the death of Bishop Brooks his classmates decided to erect a building as a memorial to him and to his unlimited interest in the religious

life of Harvard. It was decided to raise $300,000 and to call the building Phillips Brooks House. The endowment was to be applied under the direction of six trustees, of whom no more than two were to belong to the same religious denomination.

The committee raised much less than was expected (only about $50,000), and so the original broad plans of erecting a building "dedicated to the comfort and succor of all in the college world who were in trouble, sorrow, need, sickness," had to be given up, and only the chief purpose, affording a home and workshop for all forms of spiritual activity and benevolent action in the university, could be realized.



OCTAGON HOUSE, WASHINGTON, D. C.
Recently leased by the American Institute of Architects for permanent headquarters.

The building is to be on a line with Holworthy and behind Stoughton in such a way as to form, with Holden Chapel in the center, a pendant to Harvard Hall, and to give a generally symmetrical arrangement to that portion of the yard. Its position has been further emphasized by a colonial treatment of red brick with light stone trimmings in keeping with the design of Harvard Hall and the other old brick buildings. The same height of cornice has been followed, and the feeling of the old work has been preserved as far as possible.

It has been found necessary, from an architectural point of view, to reconcile the building to its position by a frank treatment of the triangular space in front. This has been made into a forecourt by means of a wall on the east running to the street, and by carrying along the front a fence of iron with brick posts and an ornamental gateway in keeping with the Harvard gates. This fence, if continued on either side in the future, will serve to reconcile the building still further to its position. The court in front is designed as a small, quiet garden to be laid out with vines and formal planting toward the street, and a stone seat against the wall at the widest part.

PARLOR MANTEL, OCTAGON HOUSE.

Plate 43. Detail of porch and front entrance, Phillips Brooks House, at Cambridge, Mass., of which A. W. Longfellow, Jr., is the architect.

Plate 44. Building for the Lutheran Publication Society, at Philadelphia, Pa., Frank Miles Day & Brother, architects.

Plates 45 and 46. The Bowlby Building at St. Paul, Minn., Cass Gilbert, architect. It is built of cream-white terra-cotta. The figures of the boys in frieze, and the circular panels back of them are done in color, and are finished in enamel in some parts, and glazed in others, the enamel being an opaque material, and the glaze being transparent, showing the terra-cotta through.

Plate 47. Warehouse building for T. Blood & Co., at St. Paul, Minn., of which Cass Gilbert is the architect. The Boston Northwest Real Estate Company are the owners.

Plate 48. Business block, St. Paul, Minn., Cass Gilbert, architect. The façade of this building is made particularly interesting by the color scheme introduced. It is built of a reddish-brown brick in two shades, the color being arranged in patterns, as indicated in the illustration.

HALL, OCTAGON HOUSE.

The American Schoolhouse. VIII.

BY EDMUND M. WHEELWRIGHT.

IN the sketch plans submitted in competition for the Providence High School, the central window generally placed in the wall opposite the teacher's desk is omitted. This is a method of fenestration often found in French schoolhouses. In the Brookline High School (for plans see second paper of this series) there are no windows in the walls facing the teachers' desks, in that following the method generally found in German schoolhouses.

HIGH SCHOOL, NEW BRITAIN, CONN.
William C. Brocklesby, Architect.

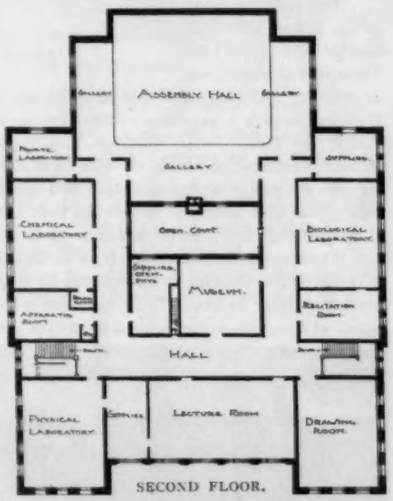
In the Brookline High School toilet rooms are arranged in mezzanines of the first story. These rooms are accessible from the staircase landing and give a compact and convenient arrangement. In this school appear also features which, I believe, were novel when the building was built, but which have since become well-nigh constant in large high schools,—a bicycle run to basement, and storage room for bicycles.

In our latest high schools we find the lunch room no longer a makeshift arrangement, but that it has become one of the customary and carefully considered requirements of such buildings. This feature was well provided for in the Cambridge High School, and again in the Brookline school, as it is in nearly all the large high schools built during the past few years.

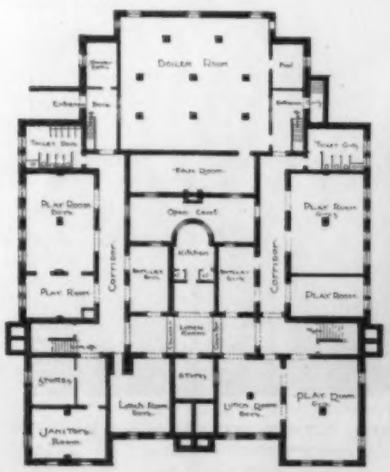
It will be remembered that Dr. Philbrick speaks in his report of his desire that such a lunch room should be established in the Latin and English High School of Boston.

The Cambridge and Brookline schools have separate wardrobes adjoining each schoolroom. In the Brighton High School (see plans in second paper of this series) the pupils' clothing is kept in individual lockers in the basement. This later method of clothing disposal was, I believe, first introduced in the schools of Cleveland, Ohio, whence the idea came for its use in the Mechanic Arts High School in Boston. It was later used in the Brighton High School, and is that adopted in the designs of several new high school buildings which are about to be built in Boston. This method of disposing of the pupils' clothing permits more economical planning than the arrangement of separate wardrobes for each schoolroom. It is found to be entirely unobjectionable, and since it dispenses with the separate wardrobes, a feature developed from the necessities of discipline of the graded schools, it would appear to be the most desirable arrangement for high school pupils.

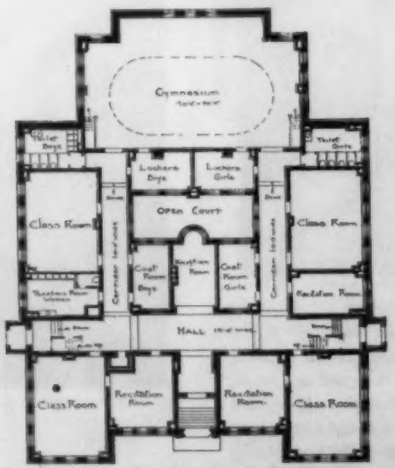
The lockers are made of ash with floors, and top and bottom panels of the doors of strong wire netting. If it is necessary to economize space, the floor area of each locker need not exceed 16 by 16 ins., and it would seem feasible, if closer arrangement were found to be necessary, to arrange the lockers in two tiers, with access given to the upper tier by a ladder running on a track, an expedient sometimes used to reach the upper shelves of a high bookcase. The lockers may be fitted with inexpensive combination locks, in which case the janitor keeps the record of the combinations, or each pupil may be provided with a key, the janitor having a master key. The rooms in which these lockers are placed should be sunny, if possible, and it should be strongly ventilated. It is better to have



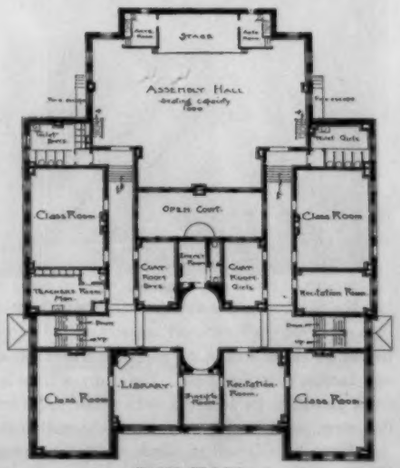
SECOND FLOOR.



BASEMENT.



GROUND FLOOR.



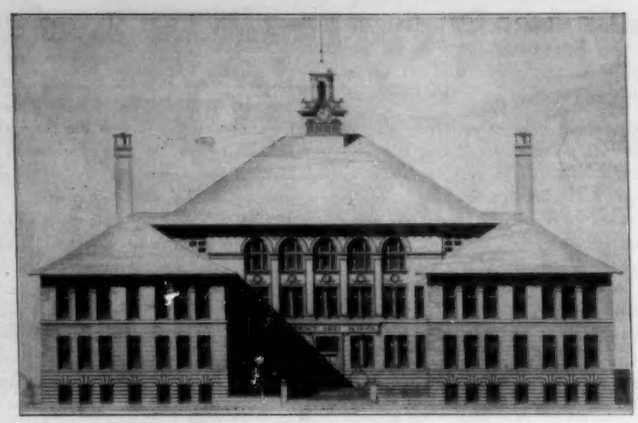
FIRST FLOOR.

HIGH SCHOOL, NEW BRITAIN, CONN.

the room ventilated through the lockers than to have the lockers ventilated through the rooms.

The "hospital" or "emergency" rooms were, I believe, a feature first introduced in the Cambridge High School. These rooms are provided in the Brighton High School and the New Britain school.

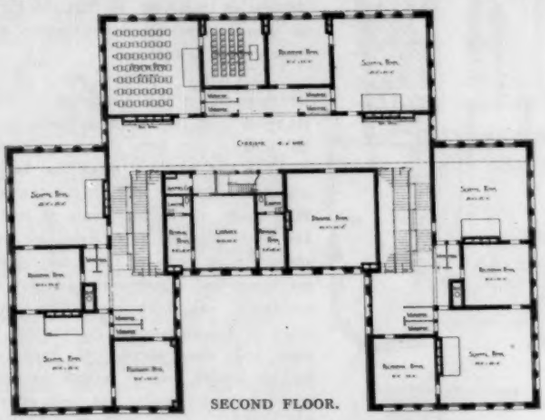
This last-mentioned school is a remarkably compact and well-planned building. It has all the essential requirements of the very latest high schools. The rooms for pupils' clothing are placed upon each story, and does not follow the grammar grade method of separate wardrobes adjoining each schoolroom.



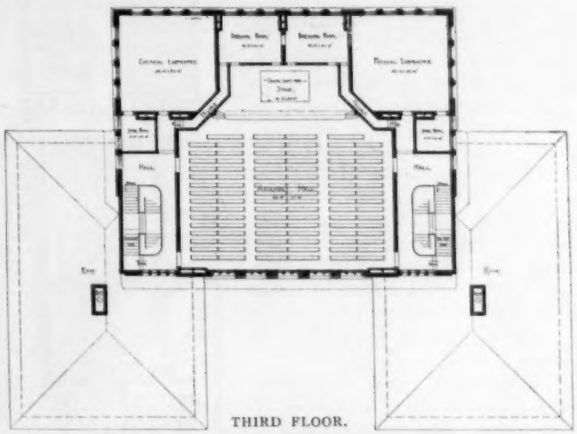
DESIGN SUBMITTED FOR HIGH SCHOOL, PROVIDENCE, R. I.
Stone, Carpenter & Willson, Architects.

The library is becoming a more important feature in high schools and in grammar schools also. This room may be given a northerly exposure. This exposure is that most desirable for drawing rooms. It is requisite that physical laboratories should have one wall with exposure to the sunlight. The room for storage of physical apparatus should be made as secure from the admission of dust as is possible.

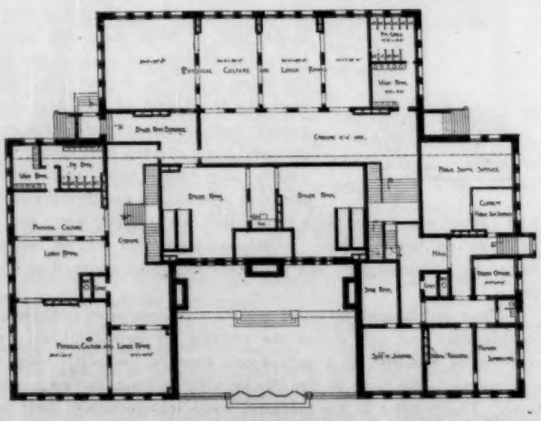
As the methods of instruction in high school houses approximate more closely to that pursued in our colleges, it would be possible to effect considerable economy in the construction of high schools if, instead of providing schoolrooms to accommodate between forty and sixty pupils, large rooms for one hundred pupils were given. Such rooms are generally provided in English and French schoolhouses. This arrangement would make a large number of recitation rooms desirable. Recitations of small classes may, however, be conducted in these large rooms without disturbance to those who are at their studies. Such a method would appear to tend towards the goal of the most enlightened educators and the development of increased self-reliance at least among pupils of the high school.



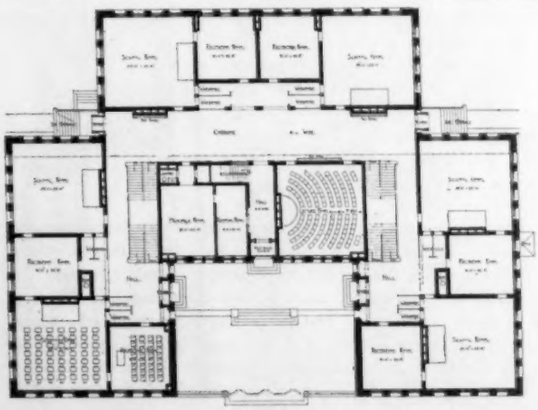
SECOND FLOOR.



THIRD FLOOR.



BASEMENT.



FIRST FLOOR.

HIGH SCHOOL, PROVIDENCE, R. I.

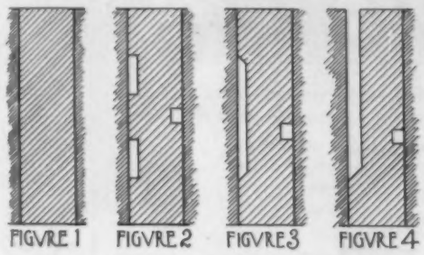
The only later-day feature which appears to be lacking in the New Britain school is a bicycle run to basement. The central light shaft is designated upon the plan as a "courtyard." This is a misnomer, as the dimensions of this feature do not warrant such a title; indeed, the space here assigned would appear to be even too scant to light satisfactorily those rooms on the first floor which gain their light from this source. The gymnasium has a running track in the gallery which is served by two staircases. Lockers for both sexes adjoin the gymnasium, receiving light from the central light shaft.

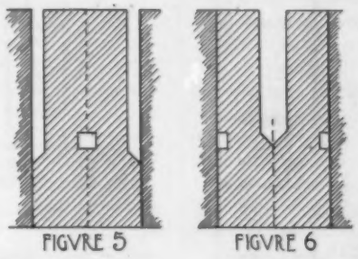
Architecture of Apartment Buildings.

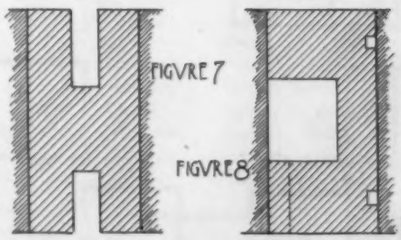
I.

BY IRVING K. POND.

APARTMENT buildings offer about as great variety in plan as do the ordinary city residences, up to and including even the more expensive detached houses. It is due in great measure to structural necessity that the various stories of an apartment building repeat, with slight variation, the chord (or discord) struck in the principal story. It is through no such necessity that house after house, in block upon block, drums monotonously on one note. This is due in part to lack of imagination in the designer, — which is a misfortune; but in greater part it is due to the general desire of speculative builders to give little and receive much, — which is a fault. This misfortune has led in apartment buildings to a deal of trivial and inconsequential planning, and the fault has so overcrowded the ground, to the exclusion of light and air, as to bring it under the ban of State and municipal authority and make the tenement house and the apartment building in crowded centers of population subjects for serious consideration to the philanthropist and social reformer.







If lack of imagination, with its resultant dreary commonplaceness, is indeed a misfortune, no less so is untamed imagination, with its equally trivial and perhaps more harmful emanations. Generally, however, where a too vivid imagination seeks to play about a problem affecting returns from financial investment it will meet restraint in the conservatism of the investor, voicing what he believes to be public opinion.

Unfortunately, this conservatism makes against innovation wrought out by trained skill acting under guidance of cultivated imagination almost as effectually as it curbs the playful antics of the untutored mind. It is this conservatism which makes difficult the first step beyond the bounds of what is (and being *is*, supposedly, is right). The reformer moves, and laws embodying sanitary measures appear; he may move again, and laws are enforced. The philanthropist takes up the work, and sanitary tenements arise amid wholesome conditions; but real estate investors as a body are neither reformers nor philanthropists, and do not move except as public opinion impels. One, adventuresome, takes a step in advance, or the step may be taken in meeting a certain contingency; should the result prove popular, others follow. This statement is in no way made to hold the investor up to blame either because of his seeming timidity or because of what really may be a reasonable conservatism, but it is made simply as a statement of fact which in itself explains the apparent slowness in the development of the medium type of real estate and apartment house, and shows sufficient reason why the many radical ideas in which their authors see naught but good (and which indeed they may contain) are not on the instant realized in permanent building materials.

Yet none the less, in spite of conservatism and ingenuity lacking in real vitality, the apartment building has developed in plan till now numerous and distinct types exist side by side. It is the purpose of this article to present for comparison and for contrast various of these types.

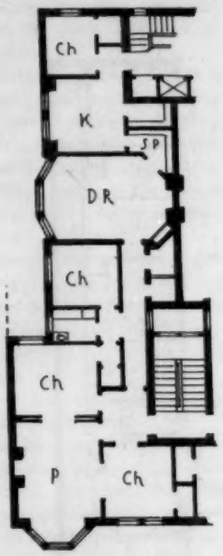
The relative importance of apartment buildings and single or private houses in modern social and domestic economy needs not to be discussed here. The apartment is here and will develop as long as men crowd into the existing centers of population or create new centers. The apartment is very much in evidence in modern domestic economy, for it was the necessity for economy which first suggested it; and the idea of economy will not separate itself from the idea of the apartment for some time to come. The economical housing of the multitude within the gates must be as thoroughly and as scientifically studied as is the economical transportation of this same multitude. Economical, safe, and rapid transit to economical, safe, and quiet domicils is the ideal to be sought in the great cities. It may be too much to expect that rapid transit ever shall become so much of a pleasure that people shall find luxury in the personal employment of its means; but it is not too much to expect that the apartment shall be as convenient in its arrangement and as complete as any house, and while being economical in maintenance, present at the same time high possibilities of taste in its plan and general decorative treatment, so that the ideals of economy, privacy, convenience, and beauty shall be realized.

In even a superficial study of the development of the apartment building its lower form, the tenement house, must be noted; for here the struggle for decency and hygienic conditions began and was fought bitterly, to the outcome that many of the tenements of to-day are better planned as to light, air, and privacy than many of the more recent medium-priced apartments in highly respectable neighborhoods. The first move in tenement-house reform was to bore wells down through the roof and various stories, and so relieve the dark inner chambers which had been utterly devoid of fresh air and daylight. In many tenement houses chambers were in series four or more deep, the second borrowing its light and air from the first, the third from the second, the fourth from the third, and so on. Not infrequently was entrance to the farther compartment to be effected only through the nearer. The "toilet room," to use so unoffensive a name for so hideously offensive a thing, was but a black stench hole, and running water was to be drawn on but one floor. Municipal regulation framed and enforced by philanthropists and reformers mitigated much of all this evil.

That which, next to greed and carelessness, most contributed to this state and still makes the problem of light, and air, and economy of construction a serious one even in the better class of apartments, is the form of the city lot with its long, narrow proportions. The problem of the tenement house was not solved until two or more adjacent lots, even to the extent of a city block, had been utilized for one scheme of building, and, by means of the courtyard, sometimes amounting almost to a park, all light wells had been banished, and all rooms, for what purpose soever, furnished with light and air direct. It is probable that the highest type of apartment building is to develop along this line, that is, about a courtyard or garden. This is the continental idea even where the comparatively narrow lot is to be contended with.

The process of development as regards utilization of ground area may be seen at a glance by referring to Figs. 1 to 4 for the single

narrow lot, and to Figs. 5 to 8 for double lots. Fig. 1 shows how absolutely light and air were excluded from the interior portions of the building in many metropolitan tenement houses not many years ago and previous to enforced use of wells, which were sunk as in Fig. 2. The scheme presented in Fig. 2 and its modification, as in Fig. 3, are in use to-day in apartments commanding fair rents, in comparatively respectable neighborhoods of our greater cities, and in many instances without the individual shaft for bath and toilet rooms which is indicated in Figs. 2, 3, and 4. It would be unprofitable to argue with a sane man for a hygienic principle in these enclosed areas for light and air, and all well-wishers of the multitudes who are forced to dwell in apartments look forward hopefully to the day when it will be equally futile to argue their financial benefit to an owner. In many cases this area, where it occurs in the center of a double building, is covered with a skylight at the roof and inadequately ventilated, which indeed would be the case were the skylight removed entirely. The roofing by skylight of shafts which give light and air to chambers or living rooms is barred by law now in every city which has a building code, and the practise must soon become a thing of the past.



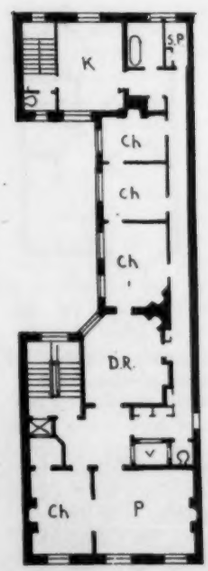
FIGVRE 9

The great step toward agreeable and sanitary conditions was made when the scheme suggested in Fig. 4 was adopted, and this scheme is now at the base of the plan of the great majority of better class apartment buildings in our city blocks. Of course the ideal sanitary condition is far away, while the bath rooms of more than one apartment give upon the same enclosed shaft, and is not reached until bath rooms open to the free air; but the court, unenclosed at one end and free from ground up, is a great advance, and depends only on its width and direction toward the sun to be ideal, from the sanitarian's point of view. Figs. 5 and 6 show possible combinations of the scheme in Fig. 4 on a double lot. The combination shown in Fig. 5 on a double inner lot is to be employed in general only under the necessities of strictest economy, for unless additional light from neighboring lots is assured, or the double lot itself is more than customarily wide, the divided court is insufficient for first-class apartments. In the scheme in Fig. 5 there is a great economy in walls and foundations, and if the bath rooms are placed on the inner shaft, cost of plumbing and sewers is reduced; but this latter saving is not commensurate with the advantage in sanitation and privacy which is gained by placing the bath rooms on the open court.

Figs. 7 and 8 present other schemes for the introduction of light and air into buildings on double lots. The idea in Fig. 7 is to shorten the narrow light courts and more effectually cheer the inner portions of the structure. To make an effective façade, the courts in this scheme should be wide enough to form a terrace or garden. Fig. 8 presents a continental scheme with apartments fore and aft, and a court sufficiently extensive to be capable of an attractive treatment in its gardening, and effective in architectural surroundings.

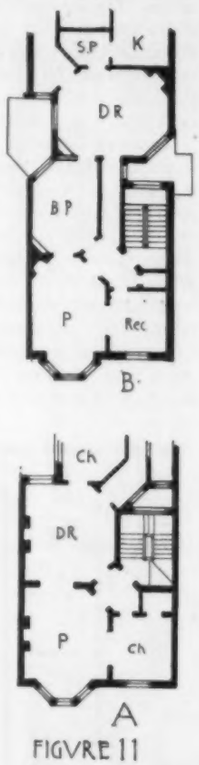
In discussing in detail the possibilities of arrangement within various outlines, any scheme possible within the outlines laid down in Figs. 1, 2, and 3 may be ignored as unworthy of further study, for no plan can be considered seriously in which living rooms give upon an enclosed shaft, or even upon an enclosed court, unless that court be more than ordinarily ample, so ample indeed as to amount to a free air space. One can conceive of a court entirely hemmed in, which by its size and condition shall be open to the rays of the sun, and so be more sanitary than some long, narrow, open courts into which the sun hardly can penetrate; but however courts may be employed, shafts on which open other than stairways or subordinate toilet rooms are to be shunned.

Also to be set aside as unworthy of consideration are all types of plans in which chambers, or living rooms, or general toilet rooms are to be reached only by passing through other rooms. To maintain the dignity and at the same time preserve the privacy of the family life has been the study of the best designers of apartment buildings in recent years. It is a comparatively modern and altogether American idea that the chambers and toilet rooms of an apartment should be as isolated as are the same rooms in a private house. The seemingly necessary position of the kitchen in the rear of the apartment has hampered the development of this idea. Because the kitchen was at the rear of the house seemed, probably, sufficient reason for placing it at the rear of the "flat," and besides, that is the position always given to the kitchen in the apartments of the French who, at least until recently, had been considered masters in the art of apartment planning. The American idea, which finds no prototype in the French or English, is that the dining room, serving pantry, and kitchen shall be *en suite*. This has led to the development of a type shown in Fig. 9, a type which, in greater or lesser degree of perfection, rules in our cities to-day. The long intervening corridor between dining room and living room or parlor, as it generally is called, which necessitates passing all chambers in the tour from one of these rooms to the other, is held to be the objectionable feature of this arrangement, and objectionable it is if chambers open directly from it on one side, and toilet room directly from it on the other, as is too often the case; but the majority of owners and designers balance over against this objectionable quality the great economy in space which is effected by this plan, and economy seems the more to be desired, and this type prevails. When the building lot is small and is completely utilized from front to rear, and rooms are curtailed in number and are of the least allowable dimensions, one need not argue against this plan; but when there is offered an opportunity to expand, then the belief grows that economy may overreach itself, and that added convenience and desirability will force a more than proportionate return on the small added investment. This added convenience and desirability is coming to be considered a necessity, and consists partly in having the dining room and parlor *en suite*, or, at least, separated by no more than the reception hall, as in the smaller city house. This has been the commonplace in European apartments, and seemingly no other scheme has been thought of. But Americans demand also, as has been noted, that the kitchen shall be very convenient to the dining room, and this, which American designers have accepted as part of the great necessity, and a large part at that, appears never to have occurred to their continental brethren, at least never to have troubled them. The Frenchman has dealt and continues to deal with the problem as indicated in Fig. 10, only that in the vast majority of instances the dining room lies across the antechamber or reception hall from the entrance to the long corridor; and it appears to present no drawback to a French apartment that servants, in preparing and clearing the board, are compelled to traverse the reception hall and the long corridor to the kitchen and serving room beyond the region of the less



FIGVRE 10

important chambers (for the principal chambers are grouped about the parlor or salon, generally). Without doubt it is fine in imagination to behold the great retinue of servants and retainers bearing the steaming meat and the viands in procession along the corridors and through the halls of state, as in good old baronial England; but what food for imagination is there in a lorn maid bearing across the reception hall the lone codfish ball and the belated breakfast tea? However it may be with republican (?) France, it would seem that democratic (?) America demanded that the commonplaces of service be as little as possible in evidence in the home life. That misguided sentiment which made every man's house, not in real spirit, but only in seeming reality, his castle was responsible for much vulgar display of shingled towers, and tin turrets, and brutal, rock-faced walls in the domestic architecture of this country, and a fevered imagination feeding on the life in the medieval castle may well tend, if not restrained, to vulgarize the life of to-day. In the American apartment no deep-seated precedent hampers, and there it is possible to make the setting of a family life which shall be direct and simple, and free from vulgar display and ostentation.



FIGVRE 11

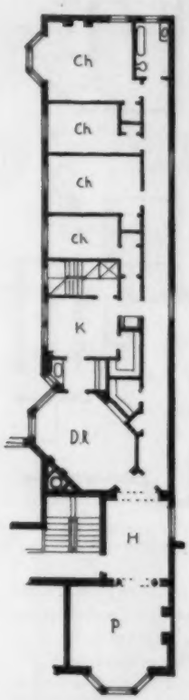
The grouping together of the parlor (and library), reception hall, dining room, and kitchen is purposely to, and does, make possible the isolation of the chambers and toilet rooms from the remaining portion of the apartment. That this separation is absolutely essential to the perfect enjoyment of life in an apartment need not be argued; but when it is achieved at the expense indicated in Fig. 11 (A and B) the plan is worthless and lacking in desirability as compared with the earlier plan developed along the lines indicated in Fig. 9. Fig. 12 shows a development of the newer type, which has been found to be highly attractive. The one point, or rather line in all plans of this general type is the long corridor, which, from an esthetic point of view, is not so attractive as is the stairway of the house, but this must be offset against the convenience of the general plan. And the long corridor of course is necessary only in buildings on the long narrow lot, and it is away from this that designers are striving to get, by various ingenious combinations.

CLIPPINGS.

GREAT importance attaches to the statement made by Mr. L. L. Buck at the last meeting of the A. S. C. E., that deep corrosion results from the contact of limestone in concrete with metal. This fact is said to have become apparent in the anchorage of the suspension bridge at Niagara, the main cables of which are imbedded in a concrete made of limestone. The discovery was recently made that at the points of contact between the spalls and the wires, the latter were badly corroded and in some instances entirely severed. — *Architecture and Building.*

IT is reported that one feature of the new building law for Chicago will be the architects' responsibility for their specifications and the strains and weights in building. In the matter of permits these will not be passed upon unless architects figure out their own weights. This regulation seems naturally to follow in the wake of the new law for licensing architects. They should welcome the responsibility proposed to be thrown on them by the new law. It is one that men skilled in their art can readily meet, and will do more to raise the standard of their profession than the lax, haphazard regulations that have prevailed so largely in the past. Such a regulation will do much to prevent flimsy building. When the highest standard aimed at was to build just good enough to pass the building department frequent accidents were inevitable. No architect will be likely to risk this responsibility, and the result will be that a large class of builders who have heretofore depended upon incompetent draughtsmen for their designs will feel compelled to seek the aid of the architect. — *Architecture and Building.*

ARCHITECTS and owners of real estate should take to heart the discussions which have been going on for some days past among the officers of insurance companies, in relation to the proper rates of insurance for fire-proof buildings of the modern kind. It will be remembered that, a few months ago, reductions were made in the rates of premium on certain classes of buildings in New York. This reduction led to a demand for reductions on other classes of buildings, and to a certain demoralization in rates generally, which, as usual in such cases, resulted in competition among the companies for policies on the best sort of risks. Such risks, apparently, they consider to be presented by the great fire-proof office buildings, and premium rates on these have fallen to a point almost unheard of in this country. One company is said to have offered to write a policy for a million dollars on the Clearing-House Building for five years, for five hundred dollars. This is one cent per year on each one hundred dollars of insurance, and the Clearing House is situated in the middle of a block, on a narrow street, and surrounded by old buildings, so that it is by no means the best risk of its kind. The manager of another insurance company is reported to have said that, "If we wrote fire-proof buildings for nothing we should lose but little. Total destruction of the steel-constructed office buildings of this city is practically an impossibility." Considering how short a time has elapsed since the insurance companies found little or nothing to commend in steel-constructed office buildings, professing to regard them as exposed to frightful but mysterious hazards, from which ordinary structures were exempt, it is with a certain astonishment that we read these new deliverances; but the fact appears to remain that steel-constructed buildings of the sort that American architects have learned to design and carry out can now be insured, with their contents, at a rate which makes it for the interest of owners to erect them. The tendency in all our cities is toward the concentration of masses of goods in warehouses, so that a building costing a hundred thousand dollars may contain a million dollars' worth of merchandise. Supposing the insurance on the merchandise, if stored in an ordinary building, to be 1 per cent. a year, and if stored in a fire-proof building, to be one tenth of 1 per cent., which would still be ten times as great as the clearing-house rate, the saving to the owner of the goods, by having them placed in the fire-proof building, would be nine thousand dollars a year. If the owner of the goods were also the owner of the building, this saving, added to that on the insurance on the building itself, would pay the interest on the extra cost of fire-proof construction over that of the ordinary kind about ten times over; while, even if the owner of the building had no interest in the goods, the owner of the latter would be glad to pay a part of the saving in his insurance in the shape of an extra rent, which would abundantly compensate the proprietor of the building for his extra outlay. — *American Architect.*



FIGVRE 12

Notes on Terra-Cotta for Exterior Polychrome Decoration.

BY ELMER ELLSWORTH GARNSEY.

THE practise of modern architecture involves the solving of the most complicated problems of design and construction; and one has but to visit any large American city to be impressed by the masterly way in which our engineers, architects, and builders have met and battled with these intricate questions.

There is an inspiration in the sight of the huge buildings which tower a score of stories along either side these cañons we call our city streets, and the imagination is stimulated when we contemplate the possibilities of urban architecture in the years which are to come.

It is a new method of construction, rather than a new school of architecture, which has so rapidly developed at our end of the nineteenth century, and it may be said that more triumphs of construction and engineering than of pure architecture have been achieved. But as the utilitarian has always preceded the esthetic, it cannot be doubted that the genius which has already conquered the laws of matter will, in time, bring under equal subjection the more pliant sympathies of art.

No Greek or Renaissance architect was ever confronted with such recurring problems of space and utility, of cost and time; and some of our critics apparently lose sight of this fact; and it may be held a truism in these days that great works of art require both deliberation in conception and despatch in execution, and that these are not to be had at slight expense.

The modern tall building has come to stay, and it must be accepted henceforth as a ruling factor in city architecture.

The area of its base is fairly fixed by the comparative smallness of city plots, and its skyward tendency is scaled by the value of the land in which its foundations are planted. Structural steel and express elevators, those swift *fin-de-siècle* mercuries, make possible the heights attained, and the question of a beautiful city has been reduced in great measure to the solving of the problem of the exterior design and enrichment of these great structures, the clothing of gaunt steel skeletons with coverings of beautiful texture and color.

The ancients had no constructions of steel demanding marble, terra-cotta, stucco, or other veneers, but they applied these incrustations to structures of brick and stone with marvelous effect and durability.

At Girgenti, in Sicily, the stucco still remains on many drums and capitals of columns which have been thrown about by earthquakes and received the buffeting of storms for more than twenty centuries.

In the museum at Palermo are terra-cotta friezes and cornices from Selinunto and other Greek ruins in Sicily, retaining their colors and patterns, which have withstood the ravages of time and the elements for even a longer period; and at Pompeii are found great quantities of terra-cotta antefixes, cornices, water-spouts, and almost every sort of architectonic enrichment, which have undergone the trial by fire as well.

Marbles have crumbled and bronzes have lost their original perfection of surface, while the baser clay still shows the touch of hand and tool impressed in its yielding surface before the dawn of the Christian era.

From the practical point of view, therefore, burnt clay may well be classed among the most valuable materials for exterior veneer, while it is not to be despised as the vehicle for more refined treatment for interior work, and even figure sculpture.

It retains the personal touch of the artist or artisan, and is not a translation by the chisel from an original model in a different material.

But above all other considerations, the value of terra-cotta as an exterior covering or enrichment on modern large buildings lies in its adaptability for color treatment, the absence of which is no less remarkable than regrettable in contemporaneous architecture.

The artistic eye does not seriously resent the typical red brick front with white marble trimmings along the streets of Philadelphia, because the houses are small and do not insist on occupying the entire field of vision; but multiply such planes by ten, placing them one above the other, and what a monstrosity we should behold!

The paler, almost colorless brick, which has had such vogue in recent years, is hardly more agreeable when used in huge unbroken masses, save in a negative way; and architectural color blindness, as exemplified in exterior construction, seems to consist of an absolute inability to conceive of other color harmonies than those of similarity.

To no other source can be traced the conception of these great façades of pallid gray or opaque yellowish white, without a trace of color from the topmost cyma down to the lowest base course, while even the window frames, sash moldings, and often iron grilles as well, are painted "to match."

It would seem reasonable that while the mass of the building might be best expressed in one general solid color, that the decorations of surface and details of ornament would be much more effective, especially at considerable heights, if rendered in contrasting and more positive colors, whether these details are rendered in relief or not.

The diffusion of light and reflections thrown up from below rob shadows and moldings of their true value and reason for being, and the loftier stories of tall buildings seldom appear to have due definition; therefore, if the grounds of entablatures, friezes, capitals, and possibly flutings of columns, decorated moldings, dentil courses, etc., were treated in polychrome, these would all gain in definition as well as in effect, without losing an iota of their intimate relation to the whole structure, while they would bring into the scheme a charming play and sparkle of color.

It would be most interesting to introduce more richly colored terra-cotta in the façades of our large buildings, and the time seems to have arrived when our architects themselves should show a livelier interest in the matter.

Most of these men have always studied architectural problems in black and white, save when perspective drawings were demanded, and they seem to dread to risk their "splendidly null" line or wash drawings to too close acquaintance with the color-box.

In view of this tendency, would it not be worth while to insist that students of architecture should be obliged to study at least a large proportion of their drawings in color? for in no other way is it possible for them to understand the value of color, or to grow into the habit of thinking in color, which must be acquired before its perfect fruits may be brought forth.

The employment of incrustations and insertions of colored marbles in Venetian palaces are too well known to be described here; and the splendid façades of Italian churches, enriched by color in stone and marble, in mosaic, graffito, fresco, majolica, and terra-cotta, are known and admired by all our students and architects who travel abroad; yet when we look about our American cities, where these gentlemen have designed miles of buildings, costing enormous sums of money, how often do we look in vain for the evidences of the influence of that color sense which imparts so much beauty and character to architecture, especially in the classic and Italian Renaissance styles!

It has often been said that the climatic and atmospheric conditions of the north temperate zone are unfavorable for the employment of exterior color, and that while Greek polychrome may have been effective and harmonious beneath the skies of Attica, the same sort of thing would be quite out of place along our northern Atlantic coast.

It is true that our climate differs from that of Greece, but the difference is greater in degree than in kind; for snow is not at all unknown in Greece, neither is our summer sunlight less brilliant

than that which gilds the shores of the Mediterranean; and for a large portion of the year our climate may be fairly compared with that of Naples during early summer and late autumn.

Besides, what could be more grateful to our Northern eyes than the warmth and richness of real color on our buildings during that season when leaden skies and snow-covered streets bound our vision, and make us long for sunnier climes and cheerier prospects?

Difficulties in the way shrink into insignificance beside the inviting possibilities of success; and it seems to have been rather a question of willingness on the part of architects, than the public, that has thus far deferred an intelligent consideration of this subject.

Our manufacturers of burnt clay are more competent to produce beautiful effects in form and color than any of their predecessors; for, heirs of the ages which have gone before, they have profited by the experience of fellow-craftsmen of the Middle Ages, as well as by the scientific skill which is at their service to-day.

These men are constantly experimenting with new clays, new furnaces, new colors and processes; and nothing short of a personal visit to the kilns themselves will give one any just appreciation of their achievements and the inherent possibilities of a lump of clay.

For exterior work the colors should naturally be fired in the glaze, as applied pigment of any sort is bound to deteriorate in the course of time; and the range of colors for terra-cotta glazes, already known and proven, is astonishingly wide, and embraces practically all those which would be desirable for either interior or exterior work. Reds, ranging from the palest pinks to the deepest madder tints; blues, from faint cerulean to dark indigo; greens, from delicate malachite to olive; yellows, from primrose to stone ochre; exquisite pale mauves, royal purple and velvety black, — a palette fit for a Titian.

Then, as to quality of color, the American terra-cotta maker does not confine his color effects to highly glazed surfaces, for, while these are useful in many cases, they are not always desirable; so, by certain processes, the brilliancy of the glaze may be reduced to a perfectly matt surface, which in texture is more like the patina of fine old bronze than anything else; and when the color also is bronze-like, the effect is very charming.

It is on molded or modeled surfaces, such as capitals, cartouches, friezes, etc., that this treatment is seen at its best, for in the process of reducing the glaze a slight modification of the relief occurs, so that instead of a sort of wire edge being left on the burnt clay, it is softened in a very subtle manner, appearing to have received the faintest "touch of time"; and as the glaze color is practically left untouched in the depressed portions of the work, a charming gradation of tone results, and a texture as of satin renders such a piece as unique as a piece of old Chinese porcelain.

Thus terra-cotta seems to possess more artistic possibilities, and to admit of more variations of form, color, and texture, than any other equally appropriate exterior veneer; and once it is brought into general and rational use, these possibilities will be increased and multiplied through experience and invention.

As to the planning of an exterior color scheme which shall be satisfactory when executed in polychrome terra-cotta, and built up against the sky, much depends upon the architectural character of the building and its environment.

Anything in the way of exuberant color spread over a great surface would hardly be desirable or admissible; and, on the contrary, very diluted tones would be inefficient at a little distance.

It would seem that as horizontal lines are so valuable in a tall façade, that these might best be emphasized by rich colors; and, to carry this point still farther, why should not an entire story or stories be made of a different color or shade of a color from those above or below? Watch a tall gray or white building or tower at sunset, and note how exquisite are the gradations of tint from the rich, rosy glow at the top to the pearly tones at the base; and why is this not a suggestion for possible color treatment?

The walls of certain northern Italian cathedrals and churches are laid up in alternating courses of black and white, or red and white marble and stone; but as this arrangement lacks variety and gives a distinctly "stripy" effect, it has little to commend it to our use.

The Doge's Palace at Venice has a very beautiful checker pattern in pearl and rose carried over its exterior color walls, which has been imitated at various times with conspicuous failure to reproduce the effect of the original; and taking into consideration the probable softening and improvement of the original through atmospheric exposure for centuries, it is not altogether remarkable that the experiments have not been successful.

An English architect, Mr. Butterfield, tried a checker in red and yellowish brick some years ago, at Keble College, Oxford, in a well-meant endeavor to gain richness of exterior color, but the result was anything but happy, as it is entirely out of keeping with its surroundings,— a sufficient reason for its failure; moreover, the colors employed were too strong, and their contrast with each other is too great for harmony.

The Albert Memorial and Natural History Museum at South Kensington, London, are conspicuous British examples of the use of terra-cotta as a constructive material, but may hardly be considered successful from the point of view of color; and in many cities, both at home and abroad, may be seen other examples of the utilitarian value of this material; but its possibilities as a vehicle of architectural and artistic expression, in form and color, have neither been exemplified nor appreciated.

As tall buildings are more often seen in contrast with the sky than with their immediate neighbors, their relation to the sky color is to be considered rather than to that of adjoining and lower structures; and as to what colors shall look best against the sky, we are not without precedent in the successful coloring of certain domes and spires for suggestions.

The green with which old copper roofs so often clothe themselves is always agreeable against the blue sky, and the color of the light yellowish-red Spanish tiles, quite on the opposite side of the color scale, seems to have been invented especially for its value as a foil to the unclouded heavens.

Again, the colors used by the Della Robbias — deep blues, a sort of emerald green, tawny yellow, and a brownish purple with a paler golden yellow — seem to form a complete scale for architectural color composition. In fact all colors may be used in association, provided their values as lights and darks, and the relative surface which they cover, be taken into consideration.

Given the desire for exterior color, or polychrome decoration of large buildings, which undoubtedly exists to-day, there are but two questions to be argued; namely, how much and what colors, and the vehicle or material which is to be colored.

The answer to the first is to be found in the artistic perceptions of those who ask it: as much color and as many colors as may be required to produce a rich and dignified effect.

A description of the walls of the ancient city of Ecbatana, in Persia (from *Enc. Brit.*, 9th Ed., Vol. II., p. 399), which deserve particular mention on account of their being among the earliest examples of constructive coloring on a grand scale, does not seem out of place here, although we are hardly ready for such a gorgeous scheme in America.

"The walls are said to have been 75 ft. broad and 105 ft. high. They were seven in number, one above the other, on the sides of a conical hill, and colored in succession, white, black, scarlet, blue, orange, silver, and the innermost gilt."

Restorations of the great Hall of Xerxes, by Chipiez, show a high cornice with many decorated members, the grounds of these colored in pale yellow, mauve, and blue, with the reliefs accented by touches of stronger value, vermilion, yellow, and rich blue, the whole effect resembling the bloom of an old rug. The frieze of arches from Susa, a full-size reproduction of which may be seen in the Louvre in Paris, shows the figures of men modeled in relief, on a large scale, with the costumes in different tones of yellow, blue, and

mauve against a background of broken blues, the whole having been modeled in clay, colored, and then cut into bricks before firing, after which they were laid up into the wall in accordance with their original positions.

These examples show that the palette is practically unlimited, and that almost any scheme of richness or simplicity may be executed in permanent form.

For interior or protected work the colors need not be "fired in"; but tempera, water-colors, or oil-colors, with gilding, may be used, and thus terra-cotta may receive as elaborate and finished decoration as any other substance.

As to what material is best adapted for polychrome architectural decoration, either external or internal, terra-cotta possesses so many obvious advantages, both utilitarian and artistic, that no other may be favorably compared with it.

One way to go about the study of exterior color is first to visit the kilns where terra-cotta is made, there to study the material itself in its various forms and developments, that its possibilities or restrictions may be properly understood; for there is no more potent influence than that of material on art expression. Observe what has been done, and then make suggestions as to what is desirable in a particular instance.

ON THE SALINE EFFLORESCENCE OF BRICKS.

THE MEANS OF AVOIDANCE.

BY DR. OSCAR GERLACH (PH. D., BERLIN).

I NOW pass to the part of my subject which is concerned with the avoidance of efflorescences, and for the sake of clearness I shall briefly recapitulate the modes of origin, taking up the means of avoidance in connection with each separately.

WHITE EFFLORESCENCES.

Sources.—I. *The Green Clay.*

1. Caused by the antecedent presence of sulphates in the clay.
2. Caused by the formation of sulphates during the storage of the clay.

Sources.—II. *The Manufacturing.*

1. During molding.
   - *a.* Caused by the presence of sulphates in the water or coloring matter.
   - *b.* Caused by the formation of sulphates during drying.
2. During burning.
   - *a.* Caused by the water-smoking.
   - *b.* Caused during burning.

Sources.—III. *Environment of the Bricks and Buildings.*

1. Caused by the absorption of saline solutions from the soil of the place of storage.
2. Caused by the absorption of soluble salts from the soil on which the building stands.

YELLOW AND GREEN EFFLORESCENCES.

1. Organic in character — caused by the action of vegetable micro-organisms.
2. Inorganic in character — caused by soluble vanadiate salts.

Source I. *The Green Clay.* The quantity of sulphates antecedently present in the clay is usually not very large, but 0.1 to 0.05 per cent. is quite sufficient to impart to the product an annoying white incrustation. To prevent this efflorescence, the soluble salts must be converted into insoluble by the addition of appropriate chemicals. The most effective and the most economical are the barium compounds, and particularly carbonate of barium and chloride of barium. Barium salts possess a strong affinity for sulphuric acid. When barium salts come into contact with sulphates, an immediate transformation takes place, the sulphuric acid combining with the barytes to form sulphate of barium — a combination absolutely insoluble in water. Expressed in chemical formulæ, the transformation of the calcium sulphate with the barium compound above mentioned is as follows: —

Sulphate of Calcium		Carbonate of Barium		Carbonate of Calcium		Sulphate of Barium
$CaSO_4$	+	$BaCO_3$	=	$CaCO_3$	+	$BaSO_4$

Sulphate of Calcium		Chloride of Barium		Chloride of Calcium		Sulphate of Barium
$CaSO_4$	+	$BaCl_2$	=	$CaCl_2$	+	$BaSO_4$

In both cases the sulphuric acid is transferred to compounds that are insoluble in water, and so is absolutely incapacitated from producing the injurious incrustations. If these salts are easily and cheaply had, it is indifferent which of them the manufacturer employs; but if they have to be brought from a distance, it is more economical to employ the chloride of barium. The reason of this is plain, from the chemical nature of the salts.

MODE OF EMPLOYING CARBONATE OF BARIUM.

We shall first take up the carbonate. Carbonate of barium is insoluble in water. To procure a uniform effect, therefore, the salt must be mixed with the clay very thoroughly and in as finely powdered a form as possible, because the transformation of the soluble sulphates takes place only where the two salts come into immediate contact with each other. The amount required is relatively very small. But since it is difficult to mix small quantities with the requisite thoroughness, a large excess of carbonate of barium should be employed, say from ten to twenty times the amount which is theoretically sufficient, in order to ensure the conversion of all the soluble sulphates into insoluble salts of barium. The excess of carbonate of barium is not injurious, since it is absolutely insoluble in water.

I will now give examples of how the matter is to be carried out in practice.

First, the clay must be analyzed and the amount of sulphates in it determined. Analyses of the kind in question are best made in a special laboratory. Let us suppose the clay contains 0.1 per cent. of calcium sulphate ($CaSO_4$). One kilogram of dry clay contains 1 gram of calcium sulphate. One English pound contains 0.455 gram. One gram calcium sulphate requires, according to the formula, for perfect conversion into barium sulphate, 1.45 grams of carbonate of barium. Hence, theoretically, for 1 kilogram of clay, 1.45 grams of barium carbonate, or for one English pound of clay, 0.66 gram of barium carbonate, must be used. Since, now, for the reasons stated above, ten times the amount theoretically required must be employed, therefore 6.6 grams barium carbonate must be used for every pound of clay. Supposing the green brick weighs 7 lbs., then for one brick 46.2 grams, or for a thousand bricks 46.2 kilograms, or 101.6 English pounds, would be required. A pound of barium carbonate costs 2½ cents. Therefore, for a thousand bricks an extra outlay of $2.50 would be necessary.

Much cheaper is the process if chloride of barium be employed, for here the transformation takes place instantly and more energetically. This salt is readily soluble in water, and in its dissolved condition is uniformly absorbed by the clay particles, so producing an immediate transformation of the soluble sulphates into insoluble. Whilst the carbonate of barium must be used in considerable excess, in employing the chloride of barium it is advisable to keep as closely as possible to the theoretical limit, because too great an excess is quite apt to cause a re-crystallization of the chloride of barium on the surface of the brick, and so to give rise to other incrustations.

THE EMPLOYMENT OF CHLORIDE OF BARIUM.

We use the same clay as before; namely, a clay containing 0.1 per cent. sulphate of calcium. One gram of calcium sulphate requires theoretically 1.8 grams of crystallized chloride of barium ($BaCl_2 + 2\,H_2O$). One kilogram of clay containing 0.1 per cent. sul-

phate of calcium requires, therefore, 1.8 grams chloride of barium, one English pound requires 0.82 gram chloride of barium.

Supposing, now, the green brick weighs seven English pounds, then one brick would take 5.74 grams, and a thousand bricks would take 5.74 kilograms barium chloride. If barium chloride costs 2½ cents a pound, a thousand bricks, therefore, would require an extra outlay of only 32 cents.

In using barium chloride, chloride of calcium is produced as a collateral product; but this has no injurious effect, since it is readily decomposed at red heat into oxide of calcium, and as such acts as a flux.

In like manner, the coloring matter and the water used should be analyzed for their sulphur, and treated accordingly with barium chloride.

Source II. Manufacturing. If the clay, treated as above indicated with chloride of barium, be used at once, no coloring will be noticeable either on the surface of the unburnt or on the surface of the burnt brick; but if the clay as thus treated be allowed to lie for any length of time, new quantities of iron pyrites will be converted under the influences of weathering into sulphates, and so fresh additions of the chloride will be necessary. If the clay has been made into green brick, the process of drying should be accomplished as quickly as possible, to prevent the subsequent accumulation of sulphates on the surface. On the other hand, quick drying prevents the deposition of possible other salts which are present, on the surface of the products. In general the deposition takes place here preferably in the interior.

It has often been observed that bricks manufactured from sulphurous clays, which come absolutely uncolored from the kiln, afterwards show distinct colorations. This is largely due to the drying. The evaporation of the water takes place in most part on the surface, and most energetically at the places which are most exposed to the draught. And so the incrustations are first and most commonly found on the edges of the product, whilst the spots where the bricks rest upon one another, and where, consequently, no evaporation can take place outwardly, are quite free from colorings. The more quickly the evaporation of the water is effected the less will be the quantity of salts visible on the surface. This is explainable from the following consideration.

The water in the interior of the bricks must ascend through the fine pores to the outer surfaces. If the water ascends slowly through the pores, occasion is given for its saturating itself thoroughly with the soluble salts and so carrying them to the surface.

The phenomenon admits also of another explanation. As stated above, and owing to capillarity, — that property in virtue of which fluids rise by attraction on the walls of minute tubes, — the evaporation of the water takes place mostly on the outer surfaces of the bricks, which constitute a system of fine tubes. Now it is a familiar fact of physical chemistry that very many saline solutions do not rise uniformly and unaltered through such systems, but that they are separated in such a process into pure water and a concentrated solution of the salt. The water hastens in advance of the salt,— and the more quickly, according as the ascent is rapid, or according as the brick is more porous, or according as the evaporation of the water is accelerated at the surface. The pure water will thus first reach the surface and be evaporated there, while the saline solution will be kept back in the interior of the brick, where it will gradually be deposited if no more water is present to dissolve it; but if the progress of the water be slow, the saline solution will reach the surface with it and be deposited there.

The incrustations, therefore, which appear during drying are found more frequently on bricks which are made from oily (plastic) clays than on bricks made from relatively non-plastic or sandy clays. In the former the porous system is considerably restricted, the orifices are smaller, and the water has more obstacles to encounter in reaching the surface. In the latter, — in bricks made from sandy clays, — owing to the greater porosity, the evaporation takes place more energetically, and not only at the surface, but also partly in the interior: first, because the interstices are here much larger; and secondly, because the sand prevents the perfect closure of the pores. This is why the smooth surfaces of pressed brick show the saline efflorescences more than the rough surfaces. By the action of the press the lateral surfaces of the brick acquire a denser structure than the upper and under surfaces. And also in ejection from the press, owing to the friction between the plastic brick and the sides of the form, these same lateral surfaces are still more densely compressed. By this compression the escape of the water is obstructed; consequently, because of its evaporating slowly and gradually, the water carries all the dissolved saline components to the smooth surface, where they are more readily rendered visible than on the rough surface, where, owing to the magnitude of the porous orifices, a partial evaporation of the water, and therefore also a deposition of the salts, occur in the interior.

There is a kindred annoying phenomenon which makes its appearance principally on the rough surfaces of the bricks, when the impressions of the workingmen's hands become visible. Frequently, after burning, certain spots are found colored white, while the remainder of the brick exhibits the normal, desired color. These are the spots at which the brick has been subjected to the pressure of the workingman's hand.

From what has gone before, an explanation for this readily suggests itself. By the pressure of the workman's hand, which is always more or less moist, the pores of the brick are closed at these spots, and the spots themselves made smooth. In consequence of the slower evaporation of the water here, the salts will be deposited at these places first, and the deposition will be rapidly augmented by the constant crystallization at these points of the saline water of the environment.

Another explanation is the following: During drying, salts come to the rough surface of the brick, but owing to the roughness of the same are not visible to the eye. If, now, by the pressure of the workingman's hand these places are flattened, and the minute saline particles crushed, the white coloration will be much more noticeable at these spots than at the remainder of the surface. An illustration will explain my meaning.

Imagine a very large number of minute particles of chalk on a slate or blackboard, and about a millimeter apart from one another. The original color of the board will not be destroyed by the particles. A short distance away, the dark coloring of the board alone will be noticeable; but if we stroke the board lightly with our moist finger, the soft particles of chalk will be crushed and pressed into the granular surface, so obliterating the dark coloring, and rendering the white path of the finger distinctly visible.

ETERNAL vigilance is the price of safety. Wherever a building, or any part thereof, has once come to grief under stress of attack by fire and water, there is proof of the existence of something which demands remedy at the hands of those interested in the development of fire-resisting construction, whose constant aim should be to increase protection and to diminish exposure. The latter is as important as the former. There are too many whose professions of confidence in the efficiency of protective appliances are such as to lead to contempt of danger, and therefore to neglect of such simple measures as guarding against exposures from without by the application of shutters, as the subdivision of space by fire walls, as the use of automatic sprinklers, and whose confidence in the value of fire-protective coverings is so great as to encourage carelessness in their design and application.

That branch of the fire-proofing industries will achieve the greatest success which is most suspicious of the efficiency of its own products, and, therefore, takes greatest pains to bring about improvement in their design, manufacture, and application. Whatever is pronounced by its makers to be "good enough" is sure to be crowded out of the market by those makers who never consider anything which they have done "good enough." If those interested in the manufacture and application of burnt-clay fire-proofing materials will work in this spirit their position will become impregnable.

Fire-proofing.

SOME NOTES UPON THE STRUGGLE FOR SURVIVAL BETWEEN BURNT-CLAY FIRE-PROOFING AND ITS NEWLY ARISEN RIVALS.

(*Concluded.*)

BY DANKMAR ADLER.

SUPPOSE that the architect of the Club House of the Chicago Athletic Association had given more thought to the fire protection of its pillars and less to their ornate wooden enclosures; suppose that the pillars, the girders, and the bottom flanges of the floor beams in the Western Union Building had had protective covering; or suppose that the enormous glass exposures of the Horne Building had had the protection of iron shutters; suppose its floor acreage had been divided by a good fire wall; suppose that a very little attention had been given to the support of its water tanks and to the fire-proofing of the supports. Even if all these things had been attended to as they should have been, even then there would have remained a certain defect inherent to the present methods of manufacture and application of clay fire-proofing material.

I refer to a tendency to break, under stress of exposure to alternations of intense heat with the cooling effect of the application of water, which has been observed at the lines of intersection of face and return members of hollow-tile blocks. This tendency has shown its greatest development at exposed corners, such as are formed by the coverings of beams projecting below the general ceiling surfaces of hollow-tile floor arches, or by the angles of pilasters formed where column coverings project from the faces of hollow-tile partitions and walls, also at the jambs of doors and windows, and still more so at the corners of rectangular coverings of free-standing pillars, even where such corners are rounded. Then there is the tendency of the bottom flange of hollow-tile arches, under stress of alternating heating and cooling, to crack away from the web members, which, if the arches are of the side-web type, cause their destruction; while in the case of end-web arches, while the arch generally maintains its integrity, the ceiling is apt to be lost.

The writer has enjoyed opportunities, in buildings erected under his professional charge, for noting the behavior of burnt-clay fire-proofing materials. These observations have demonstrated quite clearly the great value of burnt clay as a fire-protection covering for the structural members of buildings, but also call attention to the necessity for eliminating the danger which lies in the existence of an inelastic and brittle connection between face and return members of hollow-tile blocks. There is enough difference in the behavior of the protective material, under exposure to fire and water under different conditions of varying methods of application, to point the way to the corrective and remedial measures, which, however, are not stated as being finalities. Further study of the subject may develop other and more valuable suggestions. It is hoped that every one who has made or applied burnt-clay fire-proofing material, or who is in any manner interested in any building in which the same has been used, will make a study of this subject and observe and report upon occurrences like the following at every possible occasion.

Among the buildings under my observation, the Auditorium at Chicago is foremost. Its fire-proofing material is hollow tile made of porous terra-cotta, the webs being quite thick, to the best of my recollection fully 1 in. if not more. Ordinary brick clay was used, and the tiles were not burnt very hard. I remember five different fires in the building. The first, during construction, in a large unfinished room used for storing empty glass boxes, which, being filled with straw, made an exceedingly hot blaze, but caused no damage to the building other than breaking glass and burning window frames and sashes. In the completed building there were two similar fires, each of which burned up the combustible contents of a room, but caused no further damage. There were also two fires in the basement kitchen, where the accidental spilling of grease upon hot ranges set fire to the insulating covering of electric cables carried on the ceiling near by, and these in their turn caused ignition of wooden shelves, cupboards, etc. But no damage was done in either case to the structural members of the building. The writer ascribes the excellent behavior of the fire-proofing in this building to the fact that in the places where the fires occurred there were no angles exposed to irregular expansive and contractive action. The pillars were round and the coverings followed the curves of the metal; the ceilings were flush, and, above all things, the tile was thick. It had been made before the day of the theory that good building is synonymous with approximation to the condition of the captive balloon.

In the Schiller Building, at Chicago, there were two fires originating in the restaurant kitchen, as in the Auditorium, from hot grease spilled into range fires, but which also, like the corresponding fires in the Auditorium, left the structural framework and its coverings uninjured; and there was another fire which attacked the Schiller Building from without, beating upon the enclosing walls of the large court, which were formed of two thicknesses of 4 in. hollow burnt-clay tile blocks. A very fierce fire having arisen in a building about thirty feet away, the intensity of the heat was such as to break all the glass and burn the frames and sashes in the exposed court wall of the Schiller Building, and also to break the glass and burn the paint off the doors and windows in corridors and rooms inside of the building, and from sixteen to twenty-two feet distant from the exposed court wall. The floor and partition construction of the Schiller Building escaped injury, but the enclosing walls of the court were seriously damaged. The outer webs of most of the tiles fell off, particularly at the jambs of the windows, but enough remained intact that the structural steel members of the building escaped injury. The effect of the fire was the same as that observed at the Athletic Association Building, and was quite a vivid illustration of the chief, if not the only weakness of the hollow-clay tile as a fire-protective covering. There were breaks at the lines of junction with return webs in almost every hollow-tile surface exposed to the joint action of hot fire and cold water.

A reasonable inference to be drawn from these observations is, that it is necessary to so form and apply the burnt-clay tiles as to allow for free movement in sympathy with the changes of dimension caused by the action of fire and water, and yet exclude the fire from access to pillars and beams.

I shall cite two instances where this has apparently been accomplished. Both the buildings referred to have wooden joists resting on steel girders, which in turn are supported by round, cast-iron pillars.

In case of one of these, built for Mr. Martin Ryerson, at the northeast corner of Wabash Avenue and Adams Street, at Chicago, the protective material used consisted of solid blocks of porous (fire clay) terra-cotta applied to the pillars and girders and to the under side of joists, while the tops of the joists were protected by a mortar deafening 2 ins. thick. The upper story of this building was used as a manufactory of straw hats, and was filled over its entire surface and almost to its entire height with shelves and racks containing straw braid, and straw hats in various stages of manufacture. The dimensions of the place were 110 by 170 by 16 ft. The building was struck by lightning, and the shelving, racks, straw braid, and hats in the top story consumed by fire. The damage done the building consisted of breakage of glass, burning of window frames and sashes, the burning of a considerable area of floor boards, the partial burning of the 2 by 4 in. strips to which the floor boards had been nailed, the strips having been imbedded in mortar. The plastering was but slightly damaged, as its hold upon the porous terra-cotta was such as to prevent its falling off. This seems to me one of the most severe tests to which fire-proofing material was ever subjected in a building.

It is my belief that the changes of dimension induced by the action of fire and water were taken up in the small air cells of the porous terra-cotta. It is also to be noted that the column covering was circular, and therefore did not prevent any angles for breakage by reason of expansion and contraction.

In another building of Mr. Ryerson's, in which also there were wooden joists, steel beams, and cast-iron columns, the fire-proofing for the joists was made of hard tile, "book tiles" split in half. There was quite a hot fire in this building, then used for storage of wall paper, which fire was also confined to the story in which it had originated, and which also did not feaze either the fire-proofing material or the structural members protected by it. Here the ceiling tiles, which were split book tiles, and practically without return webs, had been so applied as to allow a little lateral motion; and although the fire was quite hot and the water was freely used, the tiles passed through the fire intact and free from cracks. Here, also, the column coverings were circular in plan.

Summarizing the results of these observations of the action of fire upon various forms of fire-proofing material, and noting, also, the published accounts of the conduct of such materials in fires in other buildings, and giving due heed to the published reports of various special tests, I cannot escape the conclusion that the side-web tile arch should not be used at all, even if there is a special protection for its soffit. Such protective covering should, however, always be used, and may be designed upon lines similar to those adopted for the ceiling construction under concrete arches, as, for instance, used by me in the Wainwright Building, of St. Louis, where there is a suspended ceiling of burnt tile (book tile) below a system of concrete arches of large span. While where the end-pressure arch is used protection for the soffit may not be essential to the safety of the arch, yet if it has an independently suspended ceiling that will not come to grief, but will yield to expansion and contraction, as was the case in the Ryerson Buildings quoted above, and therefore its use is advisable. Column coverings should always be made circular in plan. Jambs should be formed of solid blocks of porous terra-cotta, and not of hollow tile.

These changes in current methods suggest themselves to me. Many others, perhaps more valuable, will occur to those more conversant than I with processes of manufacture. Still, when all has been considered, it seems strange how little may have to be done to enable the burnt-clay tile to maintain the claim of its makers, that it is the best fire-proofing material available for ordinary building construction. The modifications of current practise need not be many, but whenever found necessary they must be made. Therefore, I repeat that the side-pressure arch must go, as must also the rectangular column covering with and without rounded corners, unless it be made of solid blocks of porous terra-cotta. The hollow-tile jamb block must be abandoned and solid porous terra-cotta blocks used in its place. While some modification of the form of wall and partition tiles is necessary in order to avoid the cracking away of face from return members, I am not sufficiently familiar with the processes and possibilities of tile manufacture to feel qualified to make any suggestion, but I hope that tile makers may find a simple and effective solution. In making these, as well as all other forms of tiles used in fire retardent construction, strength must be sought for in preference to lightness.

Those interested in the manufacture of clay fire-proofing materials owe it to themselves and to the community which they serve, that they abandon the claim that there is any protective covering which can make a building really fire-proof, or even reasonably fire retardent, unless it is used and applied with ordinary good judgment. It must always be remembered that the hollow-tile arch and the clay column and beam covering will not increase the fire-resisting qualities of glass, and that to leave a single heavily loaded beam or pillar unprotected or inadequately protected may cause the collapse, not merely of this particular unprotected member, but also of large areas of floor and wall resting upon beams connected with it by means of bolts and rivets.

Mortar and Concrete.

HYDRAULIC CEMENTS.

BY CLIFFORD RICHARDSON.

FINISHED CEMENT.

THE best Portland cement is a light gray or neutral tint, with a tinge of yellow and green, and a specific gravity of about 3.15. If the color approaches too nearly white, or is too dark, or has too yellowish a tinge, the burning or composition is at fault. The best Portlands vary somewhat in shade, depending on the amount of iron oxide present, but all have a similar color and one which is characteristic of good cements, and not at all like that of slag or hard-burned natural cement.

If the burning is not satisfactorily carried out the specific gravity of the cement will vary from the normal, as will the volume weight or density, although the latter is also affected by the degree of fineness to which grinding has been carried and the length of time the cement has been stored. The most thoroughly burned Portland cement has a specific gravity of about 3.15, never below 3.10, and rarely above 3.18, at 60 degs. Fahr. At higher temperatures it is relatively less, and for a number of brands recently examined the following results were obtained: —

Brand.	Specific Gravity at 78 degs. Fahr.	Specific Gravity at 60 degs. Fahr.
Germania	3.078	3.175
Alsen	3.079	
Vulcanite	3.036	
Black Eagle	3.075	
Belgians	2.924–3.013	
Sand Cement	2.757	

The best Portland cement should be so fine that not more than 25 per cent. will fail to pass a two hundred mesh sieve, 10 per cent. a hundred mesh, and none a fifty mesh sieve. Coarser cement should command a smaller price, as the amount of sand that can be safely mixed with it is largely dependent on its fineness. It has been found by Le Chatelier that particles larger than those which will pass an ordinary sieve of one hundred and twenty meshes to the linear inch are of little hydraulic value, being slowly decomposed and hydrated, and then not entirely even after a long time. Cement having a specific gravity of less than 3.10 should be looked upon with suspicion. When of normal character of fineness and gravity the volume weight per cubic foot is between 100 and 108 lbs., as packed in barrels commercially, as compared to the 65 to 80 lbs. which natural cement weighs.

SETTING.

Portland cement, and in a similar way natural cement, when mixed with water to a paste, in the form of mortar, becomes hard on standing, or sets. This is the result of a chemical reaction in which water takes an essential part, as it will be found that cements will not harden or set with any liquid which does not contain it. According to the most reasonable theory water plays two parts in the process: in one decomposing the original compounds of the cement and acting as a solvent for the products of their decomposition; in the other combining with these products to form new hydrated crystalline solids which, in their formation and crystallization from the watery solution, bind themselves and the mass together, bringing about the result called setting. The original substances of which cements are composed are, in Portland cements, very basic compounds of lime, with silica and alumina, or iron, which are easily decomposed by water with the liberation of lime and the formation of the hydrated compounds. On the decomposition of the aluminates of lime, when Portland cements are mixed with water, free lime is liberated, and, if the cement is not immersed in water, soon begins to crystallize out in the mass in the form of plates of calcium hydrate, which can be observed under the microscope. If the cement is then, or later, im-

mersed in water, this free lime is gradually dissolved out, and may be detected by the soapy or alkaline feeling which a limited volume has in which the cement is placed. It is also noticed, where cement concrete is placed in water, the volume of which is limited, as a pellicle of calcium carbonate which forms on the surface under these conditions.

This solvent action might go on indefinitely were it not for the density of Portland cement mortar, and unless, as is claimed, the action of carbonic acid of the air or water put an end to it and exercised an important influence in the hardening of cement. At the same time, if there are salts in the water which attack carbonates, no protection can be gained in this way. It is unlikely that there is any lime actually free in a high-grade Portland cement, this being distinctly characteristic of the natural cements, but rather that, in those containing a high percentage of lime, it is in such a state of combination with alumina as to be more rapidly liberated with the evolution of heat in the presence of water than would be the case if there were less of it, or if it were stably combined with silica by harder burning. In fact, it is found that the larger the percentage of lime a cement has the more care must be given to the burning, and the higher and longer the temperature must be in order to bring about the entire combination of the lime in forms which shall not be too rapidly hydrated by water. The calcium aluminate, which has been decomposed by the water with liberation of lime, is the cause of the first or initial set of Portland cement, the less basic aluminate becoming hydrated and crystalline. The nature of the set, whether quick or slow, depends on the amount and basicity of the aluminates; and, as has been shown, when there is too large a portion of aluminates, or too basic ones, the set is fiery. The basic silicates of lime are decomposed more slowly than the aluminates, and contribute chiefly to the hardening of the cement or mortar, as shown by the Newberrys. Portland cement forcibly burned and ground usually sets very rapidly and often becomes heated on mixing with water. For example, 10 ozs. of new cememt mixed with 20 per cent. of water at ordinary room temperature, balled up very much, heated, and on immersion of a thermometer in the mortar an elevation of 23 degs. Fahr. was observed. Such cement is, of course, unsuitable for ordinary use, as it cannot be well mixed and put in place before setting.

If the cement is left exposed to the air and in storage for some weeks it will be found to set slowly, having in the meantime become, to a certain degree, hydrated. It is customary, therefore, to store cement for some time before putting it on the market, but where this is not convenient, a similar result can be brought about in another way. It has been found that burned gypsum or plaster, when added in small amount to very rapid setting cement, has the effect of reducing the set to normal. No more than 1 or 2 per cent. is required for this purpose. Its use is not considered out of the way, and it is a common practise with most manufacturers both abroad and at home. Its action is supposed to be due to the fact that it combines with the basic aluminate of lime and prevents its too rapid decomposition and hydration. If plaster is used in excess, however, it is claimed that it has an injurious effect, especially in the presence of sea water. Portland cement should not set, at ordinary temperatures, in less than an hour, except in particular cases where it may be necessary to use it in presence of water. This slow set is one of the features which distinguishes it from the quick-setting natural cements.

When subjected to cold it will be found that the setting of both kinds of cements is much delayed, and at a freezing temperature will be prevented under any conditions, whereas heat may be made to produce as much effect in a short time as would require weeks at ordinary temperatures. Portland cement will, however, act much more satisfactorily in cold weather than natural, and will eventually attain a satisfactory strength very often where the latter crumbles, especially if once it has attained its natural strength.

Hardening of Cement. Beyond the mere preliminary act of setting or becoming firm there is a change in cement which goes on for a long time, accompanied usually by a continued increase of strength. It may be described as hardening. It involves chemical changes and the rearrangement of the elements of the cement, depending on the action of water and carbonic acid on its constituents. Much water and some carbonic acid enter into combination with the silicates and aluminates. For example, at different ages after being made up and kept in water neat briquettes of an American Portland cement, after being taken from the water and dried at 212 degs. Fahr., contained the following amounts of water and carbonic acid:—

	H_2O	CO_2	H_2O Free.
1 day test	5.06%	1.92%	2.02%
7 „ „	6.47	2.79	2.88
28 „ „	7.94	2.36	2.56

It appears that with Portland cement a relatively small amount of water is present and necessary for the set of the cement, but that with age water plays a prominent part in the real hardening process, while carbonic acid is of minor importance.

SETTING OF NATURAL CEMENTS.

The process of setting with natural cements is somewhat different from the comparatively simple one with Portland cements because of the presence of the caustic alkaline earths, lime and magnesia, their carbonates and undecomposed silicates, all of which enter more or less into the reaction. The aluminates, here as with Portland cements, probably produce the principal phenomena connected with the initial set, but the presence of free lime has generally a tendency to make all natural cements heat on mixing with water. Few natural cements are burned to such a degree as to remove all carbonates, and what are left seem to be capable of developing some very decided hydraulic properties with the free alkaline earths. Utica and Akron cements, which are but lightly burned, illustrate this fact.

In the final hardening, also, the undecomposed silicates very likely play the part of a puzzolana, while it is questionable whether any tricalcic silicates exist in natural cements, although a large portion of the silicates have been decomposed in burning with the formation of aluminates. We are, unfortunately, not in a position to explain the setting of natural cement as well as that of Portlands.

Further Comparison of Portland and Natural Cements. The relative proportions of water and carbonic acid present in Portland cement mortar of different ages when immersed in water has been commented on.

In the case of natural cements at early stages the amount of carbonic acid, derived largely from that not driven out of the original carbonates in burning, may exceed that of the combined water, a Cumberland briquette at the age of seven days having 9.23 Co_2–6.07 H_2O, but the relative changes with age and the acquisition of water of hydration is much more rapid than that of carbonic acid. After very long periods of time, and especially with exposure to the air, the amount of carbonic acid may increase relatively, although the increase is slow, as in the case of ordinary lime mortar. The importance of any carbonic acid found in a natural cement some time after use is, therefore, to be attributed quite as much to its original origin in the carbonates of the cement stone as to its gain in setting.

(*Continued.*)

IN the United States there are now thirty factories making cement, the output being 2,250,000 barrels annually. This industry has been almost entirely developed within the last ten years, and the greatest development has been in Pennsylvania, where the limestone is almost free from magnesia and makes a cement equal in every respect to the imported article. The country is now producing nearly as many barrels of cement a year as were imported in 1895. While the imports have not greatly increased, the home product of Portland cement has steadily grown from 454,813 barrels in 1891, 547,440 barrels in 1892, 590,652 barrels in 1893, 798,757 barrels in 1894, to 990,324 barrels in 1895, and of this quantity Pennsylvania produced more than one half.—*Philadelphia Enquirer.*

Masons' Department.

REGULATING COMPETITION — METHODS OF ESTIMATING.

BY F. E. KIDDER.

ONE of the great problems, if not the greatest problem that confronts brick contractors in many localities to-day, is to provide some lawful means of regulating competition so that there shall not be such a variation in the "brick bids" as now prevails, and so that when bids are opened one or more shall seldom be found to be so low as to preclude any possibility of a fair profit, or of doing the work as it should be done, without the contractor "going into his pocket" to pay for a part of it.

In some of the older and larger cities contractors have arrived at an understanding or agreement whereby work that is let from architects' offices goes at a figure that will give some profit if the job is wisely managed; but in many cities no such agreement exists, or if there is one, it is not kept, and the large number of would-be contractors constantly importuning architects and owners for an opportunity to figure, to say nothing of the peddling of bids by general contractors, makes the difficulty of getting a fair price still greater.

In Denver, and probably in many other Western cities, competition has been so close during the last five years that nine tenths of the building contracts have been made at figures which, after all bills were paid, barely left journeyman's wages for the contractor, and too often nothing at all. If low bidding only injured the party directly involved, it would not be a matter of general interest; but so long as it is a common custom to let the work to the lowest responsible bidder, this evil prevents those who make fair and reasonable bids from securing a contract. If a contractor wished to do good, honest work, and make, say, 5 per cent. on the contract, it has been in many cases hardly worth while to put in a bid.

Now, how can this bidding below a living profit be prevented?

One method is by means of a close association having an arrangement with the material dealers by which "outsiders" cannot procure material, and an understanding amongst its members that work shall be figured on a certain basis. This method has been made to work fairly well in some localities, but it involves some injustice, and has the nature of a "combine" which prejudices the building public against it.

The brick contractors of Denver undertook, at the beginning of the present year, to have all brick bids opened in the rooms of their association before they were handed to the architect. Extreme low or high bids were thrown out, and an average taken of the others, and 3 per cent. added to defray the association expenses. This final sum was then to be the lowest bid submitted, and the party whose original bid was nearest to this average bid was chosen to put in the low bid fixed upon. Those whose bids were above the average handed to the architect their original bid, while those whose bids were below made out new ones, so that when the bids were opened by the architect, they had all of the appearance of an open competition. A method of taking the average of the bids within certain limits would perhaps not be unjust, as the average bid is probably, in most cases, about what should be received for the work; but the particular method pursued in Denver seemed to the architects there false and unfair, and they denounced it publicly, so that it has been abolished, after having been in force for about three months.

There are other methods, looking to limiting the number of competitors, which have been tried and advocated with more or less success, but so long as there are more contractors than there are contracts to be let, it will always be more or less difficult for contractors to get a fair price for their work. The writer believes that one reason why bids are often much too low is, that the contractor does not take off the quantities correctly, or does not know, within reasonable limits, what the work will cost him. An honest contractor is not very likely to put in a bid that he knows will allow him no profit, and bids from dishonest contractors should not be accepted. In the opinion of the writer, therefore, a correct system of taking off the quantities whereby the exact cost of the labor and materials can be very closely computed is of the first importance, and if such a system were generally followed, the bids would run very close wherever a fixed standard of wages prevails.

Another advantage of a general system of estimating is that the architect can also easily take off the quantities, and figure the cost with reasonable accuracy, thus enabling him to determine beforehand about what the cost will be and what the work is worth.

After all of these years of intelligent building, contractors' associations, conventions, etc., it would seem that so simple a matter as estimating plain brickwork would have been reduced to a fixed and accurate system, or rule, long ago, but it has not, and perhaps may never be.

It is true that individual contractors can and do estimate very closely the probable cost of labor and materials, but a great many follow a very simple rule which gives neither the exact quantity of brick nor takes into account the character of the building, so that the price based upon it is largely, after all, a matter of guess work, and it is not to be wondered at that some needy contractors guess as low as they dare. In a succeeding paper a comparison will be made of different systems of estimating, with a view of showing the most accurate.

LAYING BRICKS IN COLD WEATHER.

THE composition of mortar which can be used to lay bricks in freezing weather without risk of destruction of the set of the mortar is a subject which affords a fertile opportunity for space fillers and technical journals.—we know, for we have tried it ourselves,—and yet there is a common-sense view of looking at it which ought to settle it at once, namely, that if first-class work is expected, we ought no more to expect to be able to lay bricks in freezing weather than we would to wear pajamas at Christmas. One of the curses of modern construction is the assumed necessity for haste. Our architects and constructors ought to be willing to look at it in the light of common sense, and admit that it is impossible to successfully lay any kind of masonry in freezing weather without running so great a risk of a poor resulting construction that they had a great deal better wait until the mercury goes up. This would solve once and for all the question of how the mortar should be composed. If we want first-class work we must have first-class conditions, and these simply do not exist when the thermometer is below 32 degs.

ENAMELED BRICK.

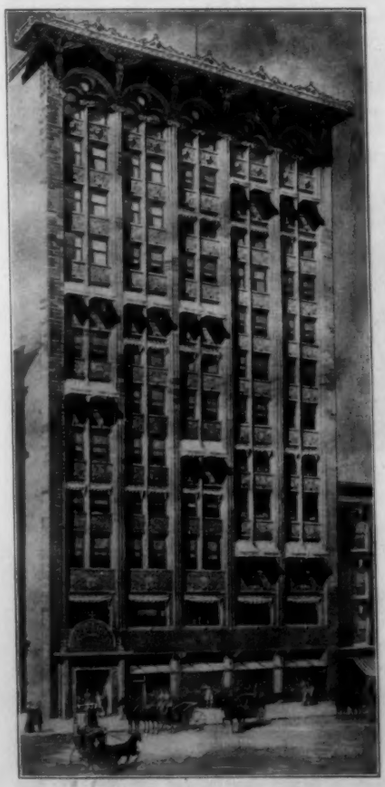
THE economic advantages of using enameled brick for elevator wells, engine and boiler rooms, and cellars is thoroughly appreciated by all who have had the management and care of a large commercial building, but is not always patent to those who are having their first experience with such investments. The extra cost of enameled brick is considerable, if good brick is used, and we should be sorry to recommend anything but the best. The advantages, however, more than offset the extra cost in the long run. Enameled brick is a non-conductor of heat and moisture, the surface is not easily abraded, and consequently preserves its appearance intact indefinitely, it is a light reflector, and all these qualities combine to discourage dirt, which is the most expensive and troublesome factor of a large building. If the byways of a big office building can be kept immaculate, the machinery will last longer, the character of the building be higher, it will be easier to rent rooms, and the temper of the attendants will be much more livable. Now enameled brick does not directly do all this; but on the same principle that an electric arc light on the street is the best kind of policeman, so the bright, light appearance of an enameled surface is a discourager of shiftlessness, carelessness, and dirt, and to that extent warrants all the extra cost of even the best manufacture.

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK.— No doubt readers of THE BRICKBUILDER who follow closely the reports of building operations in New York will be interested in comparing the report of this month's doings with that of the corresponding month of 1897. The greatest and most noticeable difference is in the falling off of the number of projected new office buildings in the business section of the city; and as these buildings are of great importance, involving a great expenditure of money, and affecting largely brick and terra-cotta interests, an inquiry into the cause of this falling will be of interest.

First, the continuance of our war with Spain is partly responsible, but not as largely as might be imagined, as reports from Wall Street show a healthy and confident condition, and money to loan on easy terms.

Last year at this time lower New York looked as though it had suffered from the effects of a bombardment (not from a Spanish source, however, for they would not have struck anything), and to visitors must have presented an odd appearance. This was on account of the unusually large number of buildings on prominent corners that were being torn down to make room for new and more ambitious structures. In place of these old buildings we now have the new Empire Building, Exchange Court, Hudson Building, Washington Life, Singer Building, and the still unfinished Park Row Building, the tallest office building in the world. The only large office building in process of construction on Broadway now is the Cheseborough Building, Clinton & Russell, architects.

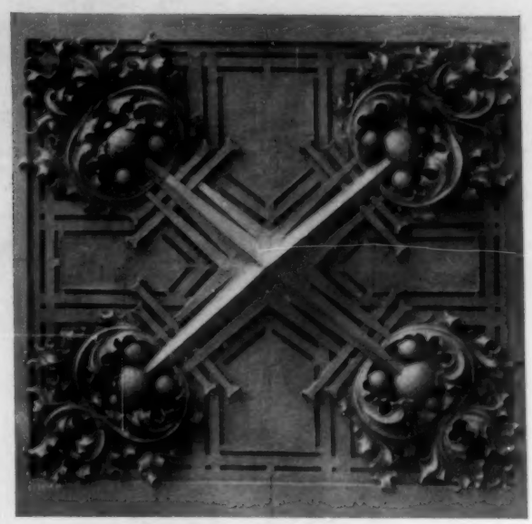


BAYARD BUILDING, BLEECKER STREET, NEW YORK CITY.

Louis H. Sullivan, Lyndon P. Smith, } Associated Architects.

The front of building is of terra-cotta, executed by the Perth Amboy Terra-Cotta Company.

Investors have continually been warned by conservative people that they were supplying offices far in excess of the demand, but few thought that the excess would be great enough to make any serious break in rentals. The craze for sky-scrapers has been at its height for the past three years, gradually diminishing as the truth was enforced that, under modern methods of construction and with the enormous capital available for the purpose, offices could be created, and were created, at twice the speed that the need of them actually grew, even in good times.



SOFFIT PANEL, MAIN CORNICE, BAYARD BUILDING.

Speculators are realizing that sky-scrapers are not the good speculative operations of which they had dreamed. It may be expected, therefore, that the sky-scrapers of the future will be those that are erected not merely for profit, but from some other reasons; that they may be built by strong estates or by great corporations, the former looking for very small interest upon a moderate value for their land, and the latter seeking that unnamed but substantial advantage which is derived from having an imposing home; and thus, in course of time, will rentals right themselves as the business of the city grows up to the offices now at its disposal.

The next monthly meeting and dinner of the Architectural League will be unusually interesting, as it will be held in Havemeyer Hall, Columbia University, and, through the courtesy of Professor Ware, the members will have an opportunity to inspect the new and interesting group of buildings designed by Messrs. McKim, Mead & White.

Some of the more important items of new work are:—

Jeremiah O'Rourke & Son, architects, of Newark, have planned a thirteen-story brick and limestone apartment hotel, to be erected at Fifth Avenue and 45th Street; cost, $750,000.

McKim, Mead & White, architects, are at work on plans for a residence to be built on the corner of Fifth Avenue and 72d Street, for Mr. James Stillmann.

Messrs. Cable & Lucas are preparing plans for a store and apartment house to be erected on the north side of 42d Street, from Broadway to Seventh Avenue, for Mr. Charles Thorley.

C. L. W. Eidlitz, architect, has filed plans for two three-story brick telephone exchanges, to be built on 79th and 89th Streets; cost, $50,000.

Clarence True, architect, has planned eight six-story brick dwellings, to be built on Riverside Drive, at a total cost of $266,000.

De Lemos & Cordes, architects, have planned a four-story brick office building to be erected on the corner of Second Avenue and 21st Street; cost, $150,000.

M. W. Morris, architect, has planned a brick and stone fireproof extension to the Hotel St. George, Brooklyn, to cost $200,000.

Herts & Tallant, architects, have won the competition for the Aguilar Free Library's new building. It will be a two-and-one-half-story building and cost $35,000.

Schickel & Ditmars, architects, have planned a four-story brick

WINGED FIGURE, TWELFTH-STORY SPANDRELS, BAYARD BUILDING.

dwelling, to be erected on Riverside Drive, for Mr. William Baumgarten; cost, $25,000.

McKim, Mead & White have planned a six-story brick and stone fire-proof store and loft building, to be erected on Broadway, for J. C. Hoe's Sons.

The Knickerbocker Realty Improvement Company will erect a new hotel on the site of the old Fourth Presbyterian Church, 34th Street, near Sixth Avenue. It will be twelve stories in height, having a frontage of 80 ft., and is estimated to cost about $500,000.

Charles C. Haight, architect, has prepared plans for a brick and stone warehouse eight stories in height, to occupy the block fronting on Hudson Street, from Vandam to Spring Streets, to be erected for the corporation of Trinity Church, at a cost of $450,000.

ST. LOUIS.—The war has very materially affected the building interests here. Nearly all prospective schemes have been abandoned for the present, and in some instances operations have been suspended upon work under headway. A good season's business had been expected, and even now, should there be indications of a cessation of hostilities soon, considerable work of importance may be undertaken.

The trustees of the Barnes Hospital Fund are considering plans for a hospital which will cost over a million dollars. The money was left by the late Dr. Barnes for this purpose some years ago.

The patriotism of our citizens has aroused sufficient interest in our citizen soldiery to start a movement which may eventually give the militia much-needed homes. L. C. and W. M. Bulkley, architects, have prepared plans for an armory for Light Battery A, to be built on Grand Avenue and Rutger Street. The building will be 190 x 212 ft., the front being three stories high. The drill hall, which will be in the rear, will be 179 x 180 ft. Red brick and stone will be the materials used in the fronts.

The proposition to build the armory for the First Regiment has not assumed definite shape, although prominent citizens made an offer to build the same if the city would donate the site of the old City Hall. As the charter of the city will not permit this some other locations are being considered.

Another old landmark is about to disappear. The Dorris Block, on the northwest corner of Olive and 11th Streets, extending nearly to 12th Street, is to be replaced by a six-story commercial building, for which Shepley, Rutan & Coolidge have prepared plans.

The same architects have prepared plans for a six-story warehouse for the Ely, Walker Dry Goods Company, which will cost $100,000.

The committee in charge of the publishing of the new building ordinance report that the book will be out of press in a few days.

The St. Louis Architectural Club held its regular monthly meeting on Saturday Evening, June 4. A large number were present, and were well entertained by the hosts, Messrs. Stock Dwyer, Stiff, Draper, and Schmidt, who provided not only the customary refreshments, but good music, sketches, a lantern-slide talk, etc.

CAPITAL TO FIRST-STORY COLUMNS, BAYARD BUILDING.

DETAIL ABOVE MAIN CORNICE, BAYARD BUILDING.

A committee was appointed at the last meeting to inquire into the advisability of holding an exhibition some time during the fall or winter. The committee recommend the same and suggested that it be an inter-club exhibition, and that an effort be made to procure drawings from all the clubs, and that an illustrated catalogue be issued.

The report of the building commissioner for the month of May shows permits issued for buildings amounting to nearly double that for the previous month, but nearly all are for small residences, or unimportant improvements, which would suggest that people are taking advantage of the extremely low prices of building materials and labor to build themselves homes.

CHICAGO.—Building reports do not seem to be any better than a month ago, when the figures showed a decrease of nearly 20 per cent. as compared with the work done in the corresponding month of the previous year. One of the most important announcements chronicled this month is that of a twelve-story commercial building for Schlesinger & Mayer, to cost $1,000,000, which is being designed by Louis H. Sullivan. The interior is described as "finish of mahogany and bronze," and the exterior "Georgia marble." It would not be surprising, however, to see the building executed in terra-cotta. That material has been largely the medium of Mr. Sullivan's designs, and with such appropriateness that the additional reason for such a guess is hardly needed, that an existing stone-cutters' strike may lead to the substitution of terra-cotta. Chicago cut-stone contractors say that the competition of terra-cotta has brought them to such low prices that they cannot accept the rule of the stone cutters that there must be eight men employed for every planing machine in operation. If they do accept the rule the stone cutters must accept the alternative of a reduction in wages from $4 to $3 per day. The workmen are not far sighted enough to see beyond the temporary injury done by the use of labor-saving machinery, and they have contributed at this writing some six continuous valuable weeks toward strengthening terra-cotta as a competitor of stone.

PANEL, SPINGLER BUILDING, NEW YORK CITY.
Executed in gray terra-cotta by the Excelsior Terra-Cotta Company.
W. H. Hume & Son, Architects.

DETAIL, STORE BUILDING, PHILADELPHIA.
Executed by the Conkling, Armstrong Terra-Cotta Company.
Frank R. Watson, Architect.

In this connection it is of interest to note that School Architect Patton has made encouraging progress in inducing the board to adopt fire-proof construction. The contract for one school building just let is reported to have cost 13¼ per cent. more than the wood construction previously used. The fact that Chicago spends about a million dollars annually for new school buildings shows the importance of this departure if it proves to be an indication of future policy.

The license system for contractors has gone into effect. As the ordinance reads: ". . . Each and every person, agent, firm, company, or corporation engaged within the limits of the city of Chicago in the construction or repairing of the whole or any part of buildings and appurtenances, shall be and he or it is hereby required to obtain a license from the city of Chicago . " which license costs $2 per annum, and is obtained without examination.

Among the most important building items may be noted: A warehouse 170 by 120 ft., seven stories, by John M. Van Osdel; apartment buildings by architects Handy & Cady, Sidney Lovell, and H. C. Hoffman; a manufacturing building eight stories, 50 by 160 ft., by John H. Wagner; a ten-story fire-proof commercial building by Holabird & Roche; alterations of Marshall Field retail store by D. H. Burnham & Co.; and a fire-proof manufacturing building by S. A. Treat.

CORBEL.
Executed in terra-cotta by the Northwestern Terra-Cotta Company.
Walker & Kimball, Architects.

The Stock Exchange Office Building, which is 100 by 180 ft. and thirteen stories, was sold recently. The exterior is all terra-cotta, and one of the best of Adler & Sullivan's designs. The consideration for the building with the ground was placed at $2,530,000. Another announcement of importance to Chicago real estate interests is a purchase of three hundred acres on the shore of Lake Michigan, seventeen miles from the City Hall. On this site, it is said that Mr. Frick, of Carnegie Steel Works, and associates, will establish one of the largest steel plants in the world, including in its equipment blast furnaces and steel rail and structural steel rolling mills.

The previously mentioned Ayer Building, designed by Holabird & Roche, which is to cost $200,000, will have a front entirely of plate glass and terra-cotta.

TERRA-COTTA PANEL, INTERIOR BAPTIST PUBLICATION SOCIETY BUILDING, PHILADELPHIA.
Executed by the Conkling, Armstrong Terra-Cotta Company.
Frank Miles Day & Brother, Architects.

A BRIGHT, CLEAN, AND BRILLIANT CITY.

IMAGINE, if you can, a row of business structures with fronts made entirely of enameled bricks. What a contrast to the ordinary dull and uninteresting city block! The first feature to attract the attention would be the variety of design and of coloring, for each separate building would have been the object of a distinct color scheme, according to the idea of the architect who planned it. But all would be alike in one important particular — the harmony of color. Instead of the glaring contrast which is now observable where pressed brick and the various dull stones are the only available materials, there would be a careful

selection of such tints as, taken together, would create a beautiful and harmonious effect. The architect could give free rein to his

DETAIL OF ENTRANCE, LAWRENCEVILLE BRANCH OF CARNEGIE LIBRARY.

ideas in devising ornamental color schemes suited to the particular construction in hand.

This desirable condition is now quite possible by the use of enameled brick. These brick, the best of which are of American manufacture, were originally made in a brilliant glazed white for use in alleys and light courts, but are now made also in any color desired, and either glazed or unglazed. The latter, known as the dull finish, are particularly desirable for fronts, because they preserve, under all conditions of light, the beautiful color effects which the glaze (the glare from which is so objectionable to architects) not infrequently would hide or detract from. At the same time, the unglazed brick are just as impervious to moisture and dirt and as readily cleaned. The durability of both the glazed and unglazed brick has been so well demonstrated to architects as to need no extended comment in this connection. They have been repeatedly frozen and boiled alternately — also heated to a red heat and then plunged into cold water, without injury, the important point being that the enamel has been demonstrated by these tests to be part of the brick itself and not a mere cleavage. Thus they are seen to be not only fire-proof, but absolutely indestructible by any combined force of fire and water.

As to the comparative cost. Enameled brick laid in the wall cost less than 60 cents per superficial foot, being a little cheaper than good Bedford stone, while their advantage over this material is that they are fire-proof and can be easily and cheaply cleaned. Where it may be desired to put an addition either on top of a building or adjacent to it, any colors can be duplicated, and after the entire wall is washed down, the building will be uniform in appearance, the new and the old alike, which would be impossible with materials which absorb dirt or have to be painted. The advantages of cleanliness are not of least consideration in alleys, light courts, and basements, where they are especially valuable for sanitary reasons. They can be washed down as frequently as desired, and dark places made light and healthful. In England, the home of the enameled brick industry, the municipal laws require their use in alleys and courts on account of their sanitary qualities.

The foregoing statements as to the perfection arrived at in the production of American enameled brick, including their durability, beauty, and variety of color and shape, their bright and dull finish, as well as the severe tests mentioned, are based on facts obtained from an investigation of the attainments of the Tiffany Enameled Brick Company, of this city. Their brick are made in all sizes and shapes usually desired by architects, and may be ground perfectly for high-grade archwork. English, American, and Roman sizes are made in stretchers, quoins, octagon, round end, etc., and can be enameled on both faces, when required, for thin partition walls. Any color can be produced to order, with certainty as to uniformity of shade.—*Inland Architect.*

CURRENT ITEMS OF INTEREST.

At St. Louis the price of common brick dropped during the month of May from $5.50 to $4.25 per thousand.

Atlas Portland Cement is being used in erection of Garbage Plant at Boston.

The Union Akron Cement Company are supplying their cement for a large sewer now being constructed at Cleveland, Ohio.

Meier's Puzzolan Cement is being used by Norcross Brothers on a church at Whitinsville, Mass., Shepley, Rutan & Coolidge, architects.

Waldo Brothers have sold a considerable quantity of Hoffman and Atlas Cement for use on Metropolitan Water Board Work at Malden, Mass.

D. D. Cassidy, Jr., architect, Amsterdam, N. Y., is making plans for a four-story store and flat building, which will be constructed of brick and terra-cotta.

Several thousand barrels of Atlas Portland and Hoffman

LAWRENCEVILLE BRANCH CARNEGIE LIBRARY, PITTSBURGH, PA.
Alden & Harlow, Architects.

Rosendale Cement will be used on three sewer contracts at Somerville, Mass.

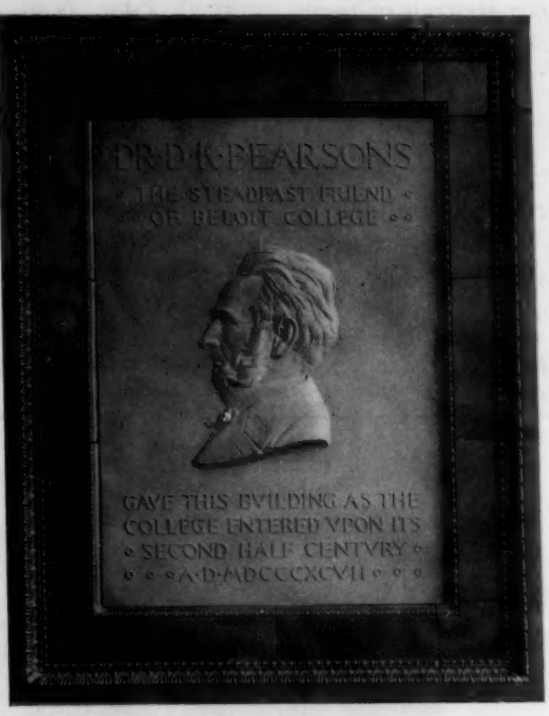
THE BOLLES REVOLVING SASH COMPANY has arranged for the exclusive manufacture and sale of the Queen Overhead Pulley and Window Stop Adjuster. These devices were formerly manufactured and sold by the Queen Sash Balance Company.

W. L. MILLER has bought Atlas Portland Cement of Waldo Brothers for contract for piers on Summer Street, South Boston. Atlas Cement is to be used on all the masonry connected with this new street and bridge.

THE EXCELSIOR TERRA-COTTA COMPANY, through their Boston agent, Charles Bacon, has secured the contract to furnish the terra-cotta for a new hotel at Albany, N. Y., H. Neil Wilson, Pittsfield, Mass., architect; J. Clark & Co., Chicago, Ill., contractors.

WALDO BROTHERS have closed with Horton & Hemenway for the supply of Hoffman Cement for the new Back Bay Station, Boston. Hoffman Cement will also be used on approaches and track-widening changes connected with the new stations of New York, New Haven and Hartford Railway.

THE BOLLES REVOLVING SASH COMPANY have had their sash specified in the following projected buildings: Public schools, Rivington and Eldredge Streets, Houston and Essex Streets, Rivington and Forsyth Streets, New York City; also for the New York Hospital, Cady, Berg & See, architects; and the Hebrew Charities Building, New York City, De Lemos & Cordes, architects.



COMMEMORATIVE PANEL, BELOIT COLLEGE, BELOIT, WIS.
Executed in terra-cotta by the American Terra-Cotta & Ceramic Company.
Patton & Fisher, Architects.

THE plant of the Illinois Supply and Construction Company, at Collinsville, Ill., suffered loss by fire, May 29, amounting to $25,000. The plant will be immediately rebuilt, but no loss will be occasioned by the delay, owing to the fact that they had a large stock of brick on hand.

THE BRICK, TERRA-COTTA AND SUPPLY COMPANY, M. E. Gregory, proprietor, Corning, N. Y., has contracted to furnish the following buildings with terra-cotta: Masonic Temple, Geneva, N. Y., A. B. Camp, architect; Masonic Temple, Monticello, N. Y.; Wilmerding School, Wilmerding, Pa., C. H. Bartelberger, architect; Farrell Building, Buffalo, N. Y., E. R. Williams, architect.

THE DAGUS CLAY MANUFACTURING COMPANY, Daguscahonda, Pa., are supplying through their Philadelphia agent, O. W. Ketcham, 150,000 flashed Roman brick for a new factory at Kane, Pa.; 30,000 pink brick for a new building in New York City, of which D. A. Callahan is the owner; also 30,000 gray brick for the new City Hotel at St. Mary's, Pa.

THE BURLINGTON ARCHITECTURAL TERRA-COTTA COMPANY, through their New York agents, H. F. Mayland & Co., are supplying the terra-cotta for the new buildings 155, 157, 159 West 34th Street, New York City, George H. Van Auken, architect; also the new building at 80 and 82 Fourth Avenue, William J. Dilthy, architect.

CHARLES E. WILLARD, Boston, removed his office on June 1 from 171 Devonshire Street to a more convenient location on the street floor, at 192 Devonshire Street. Mr. Willard will continue to handle a full line of clay products, and invites inspection of his new exhibit of a large variety of sample brick, of both mud and dry pressed process.

JAMES A. DAVIS & CO., Boston, are furnishing Alpha Portland Cement in the construction of the new Southern Terminal Station, Boston; also for the Back Bay Station sea-wall and bridge foundations. The United States Government is using large quantities of Alpha Portland Cement in their engineering works along the Atlantic coast.

THE UNION AKRON CEMENT COMPANY, Buffalo, N. Y., have closed a contract for 3,000 barrels of Akron Cement with the Alcatraz Paving Co., Philadelphia; and also for 15,000 barrels with E. D. Smith & Co. for the Philadelphia and Reading Subway tunnels which are to be built in the city of Philadelphia.

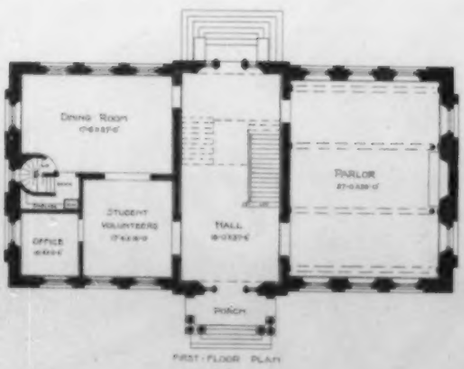
THE BERLIN IRON BRIDGE COMPANY, Berlin, Conn., are supplying the steel framework on the following new buildings: New station and car house for the Spencer, Warren, and Brookfield Street Railway Company, at Brookfield, Mass.; new building for the Waterville Cutlery Company, at Waterville, Conn.; new power house for the Bryant Electric Company, at Bridgeport, Conn.; addition to the Wilmot & Hobbs Manufacturing Company's plant, at Bridgeport, Conn.; and new power house for the Port Chester Railway Company, at Port Chester, N. Y.

SAYRE & FISHER COMPANY, through their Boston agent, Charles Bacon, are supplying the gray brick being used in a mercantile building now under process of construction at the corner of Beach and Utica Streets, Boston, Winslow & Wetherell, architects; C. Everett Clark, contractor.

The same company has recently taken their third order for enameled brick for the new Terminal Station, Boston, Shepley, Rutan & Coolidge, architects; Norcross Brothers, contractors. They have also secured a large order for enameled brick for the Back Bay Station of the New York, New Haven & Hartford Railway, at Boston, Shepley, Rutan & Coolidge, architects; Horton & Heminway, contractors.

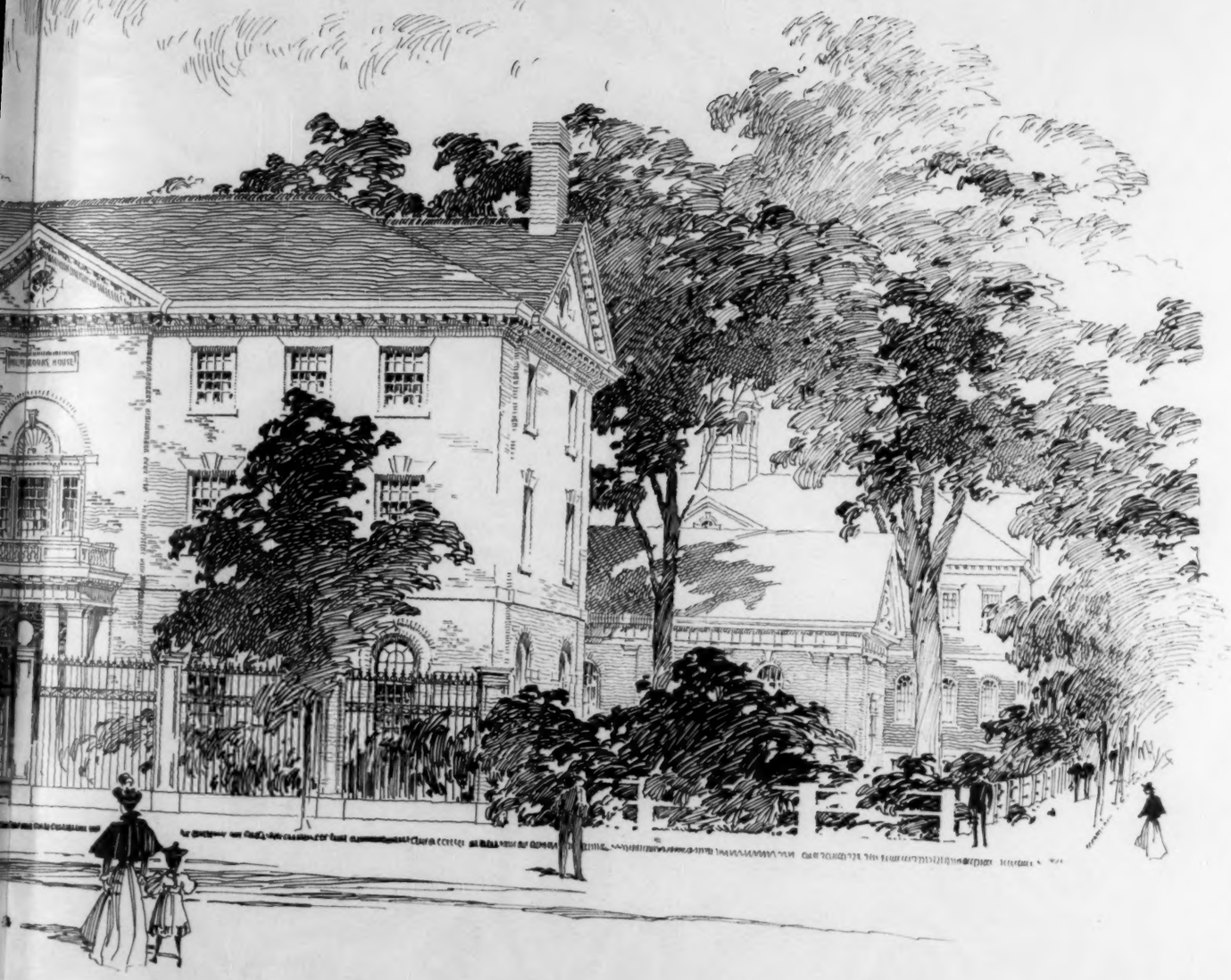
THE MASON SAFETY TREAD is growing in favor with conservative architects and real-estate owners as a protective appliance for

stairways. Among work recently specified are the following-named buildings: Cambridge City Hospital and Randall Dining Hall, Cambridge, Wheelwright & Haven, architects; New England Telephone & Telegraph Company's building, Oxford Street, Clarence A. Perkins, chief engineer for the company; Subway station at Haymarket Square, Howard Carson, chief engineer; Subway stations at Scollay and Adams Squares, and office building of Transit Commission at Brattle and Court Streets, Charles Brigham, architect; First Corps Cadets Armory, Columbus Avenue, William Gibbons Preston, architect; Dorchester schoolhouse, Hartwell, Richardson & Driver, architects; South Boston schoolhouse, Herbert D. Hale, architect; fire-engine house, Haymarket Square, Perkins and Betton, architects; ferry house, South Ferry, city of Boston, Maginnis, Walsh & Sullivan, architects; Worcester County Court House, Andrews, Jaques & Rantoul, architects; State Hospital for the Insane, Westboro, Kendall, Taylor & Stevens, architects; Cambridge Savings Bank, C. H. Blackall, architect; Brookline Savings Bank, F. Joseph Untersee, architect; town hall, Revere, Greenleaf & Cobb, architects; police headquarters and court house, Newton, Lewis H. Bacon, architect; Union Station, Omaha, Walker & Kimball, architects; Alice Building, Providence, R. I., Martin & Hall, architects; Besse Building, Springfield, Mass., B. H. Seabury, architect; Meier & Frank Building, Portland, Ore., Whidden & Lewis, architects.

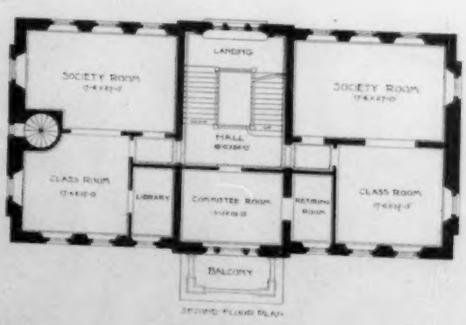


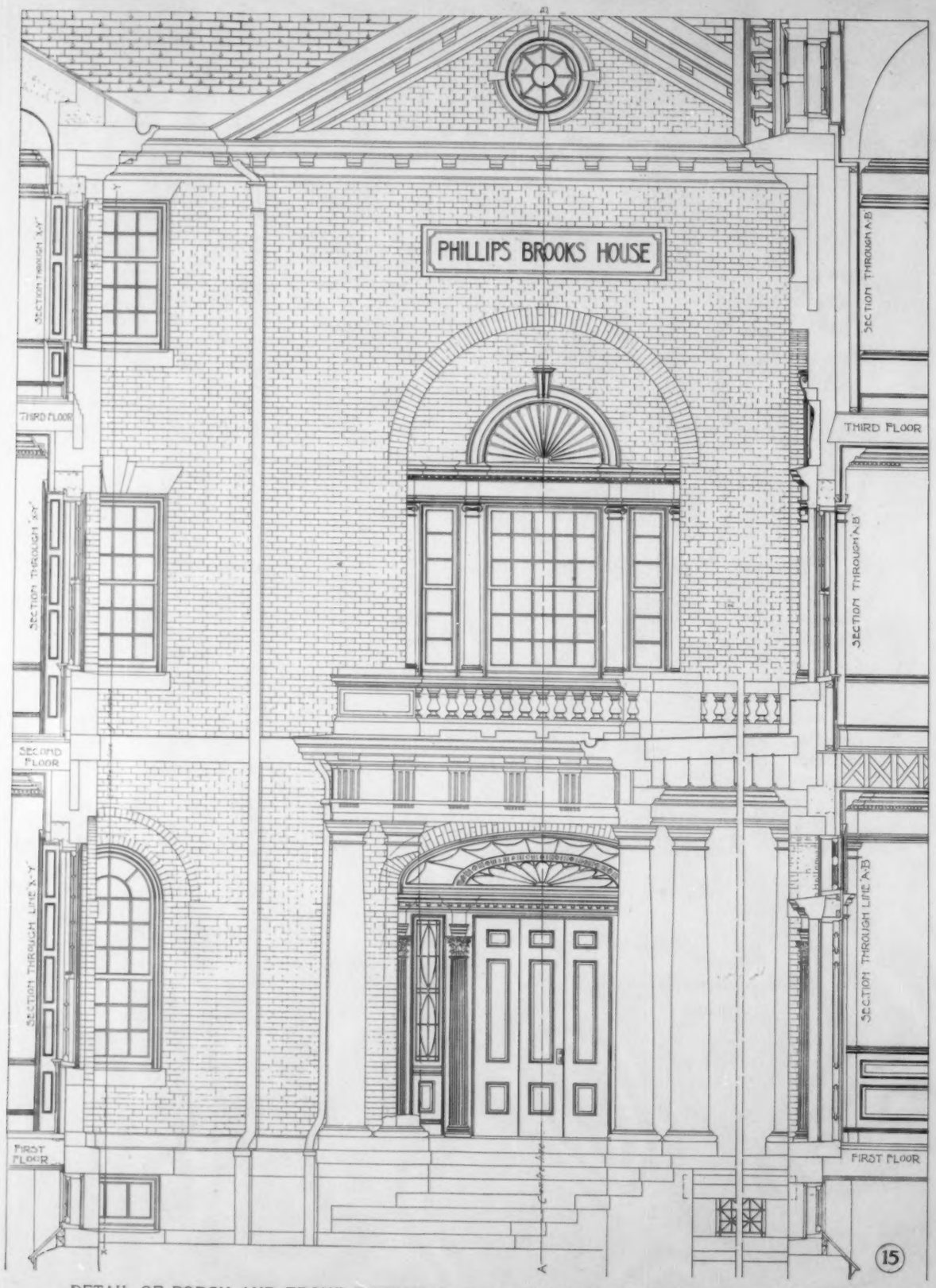
PHILLIPS BROOKS HOUSE, CA

A. W. LONGFELLOW, JR.



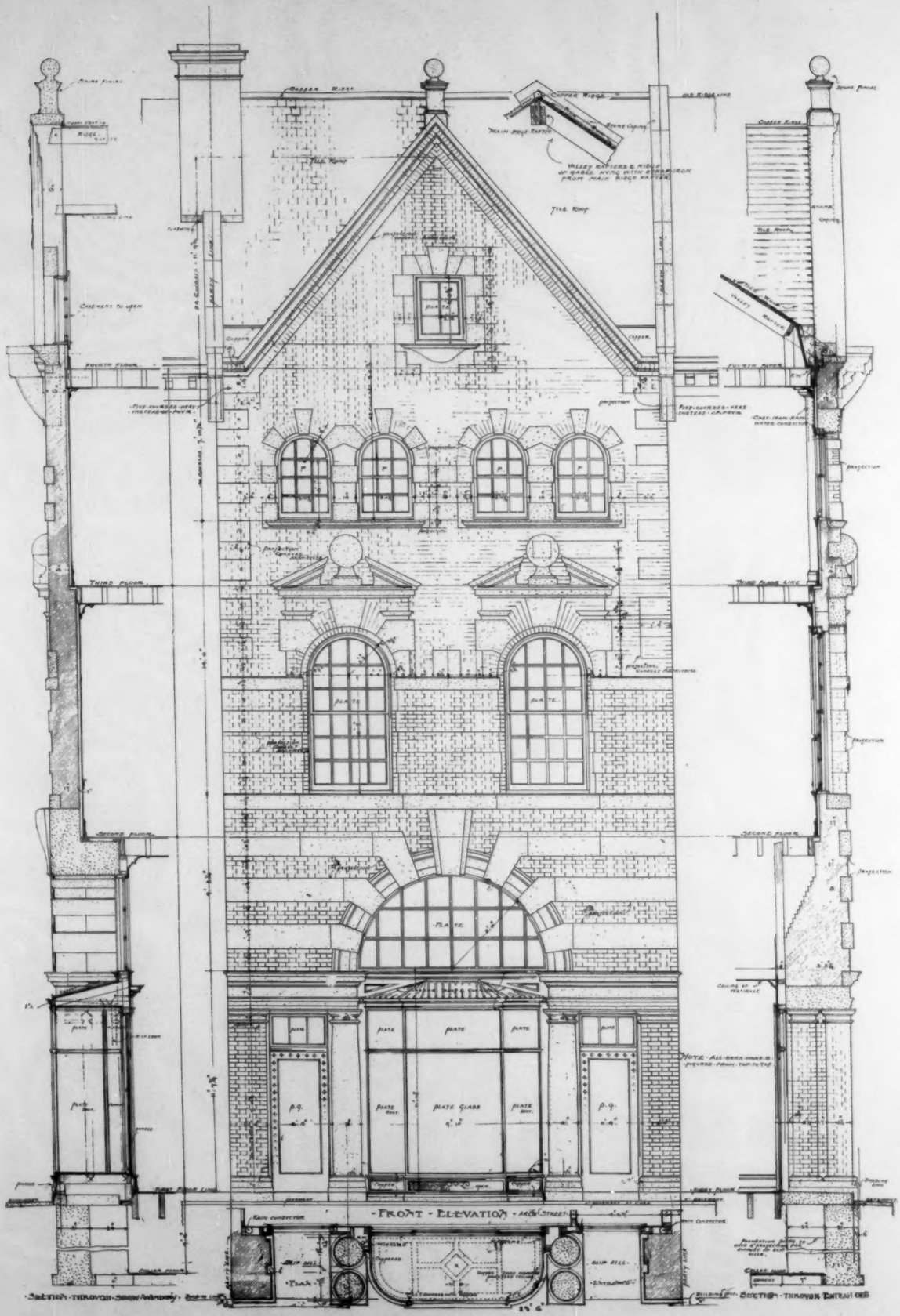
USE, CAMBRIDGE, MASS.
OW, JR., ARCHITECT.





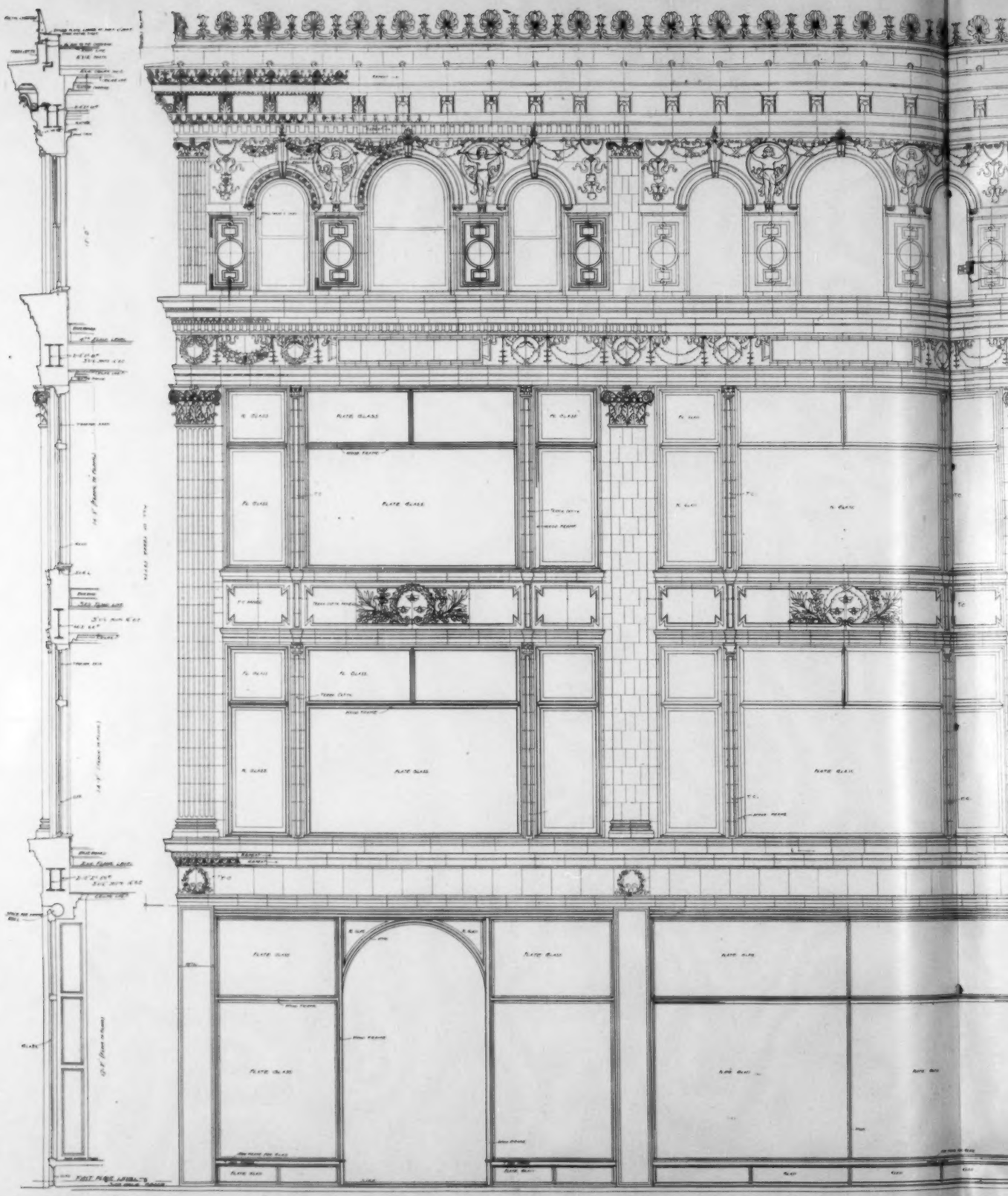
DETAIL OF PORCH AND FRONT ENTRANCE, PHILLIPS BROOKS HOUSE, CAMBRIDGE, MASS.

A. W. LONGFELLOW, JR., ARCHITECT.



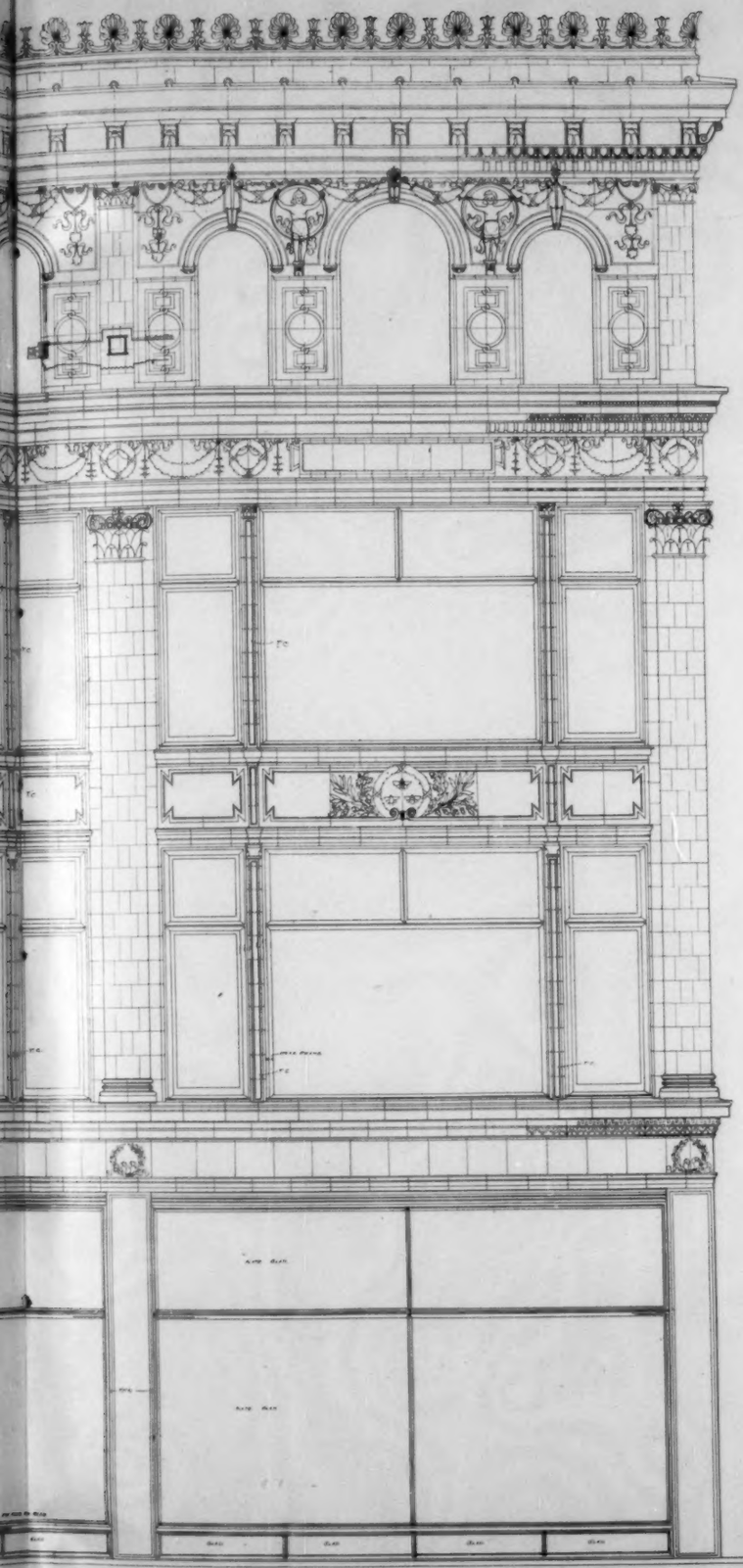
BUILDING FOR THE LUTHERAN PUBLICATION SOCIETY, PHILADELPHIA, PA.

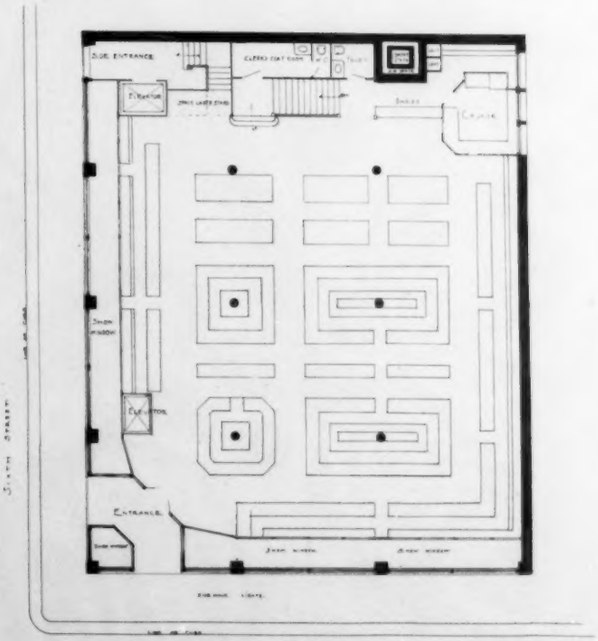
FRANK MILES DAY & BROTHER, ARCHITECTS.



ELEVATION ON ROBERT STREET · BOWLBY BUILDING · E·D·C
ST·PAUL MINNESOTA

CASS GILBERT ARCHITECT

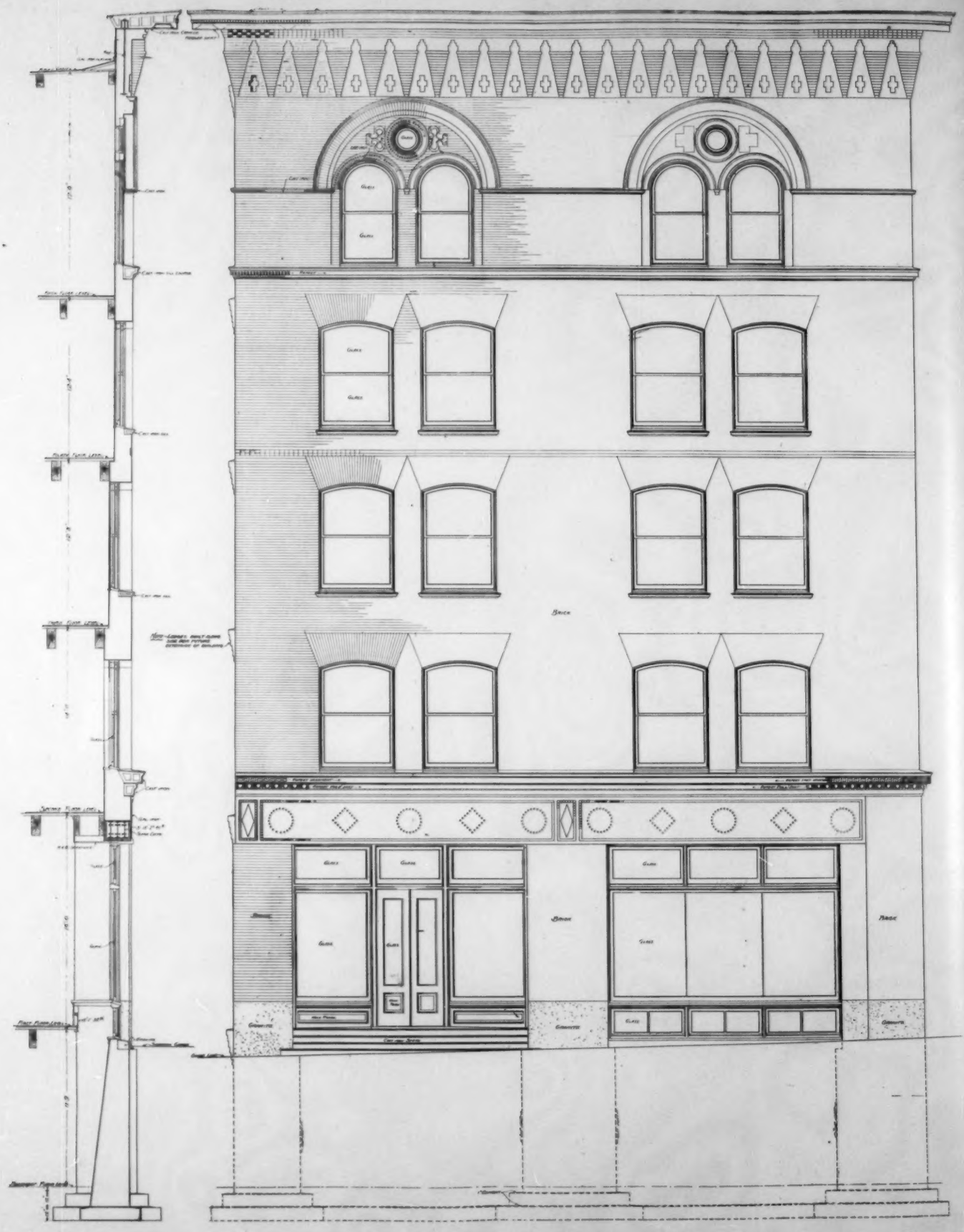




FIRST FLOOR PLAN

·E·D·CHAMBERLIN OWNER·

SCALE ½ INCH = 1 FOOT



SECTION

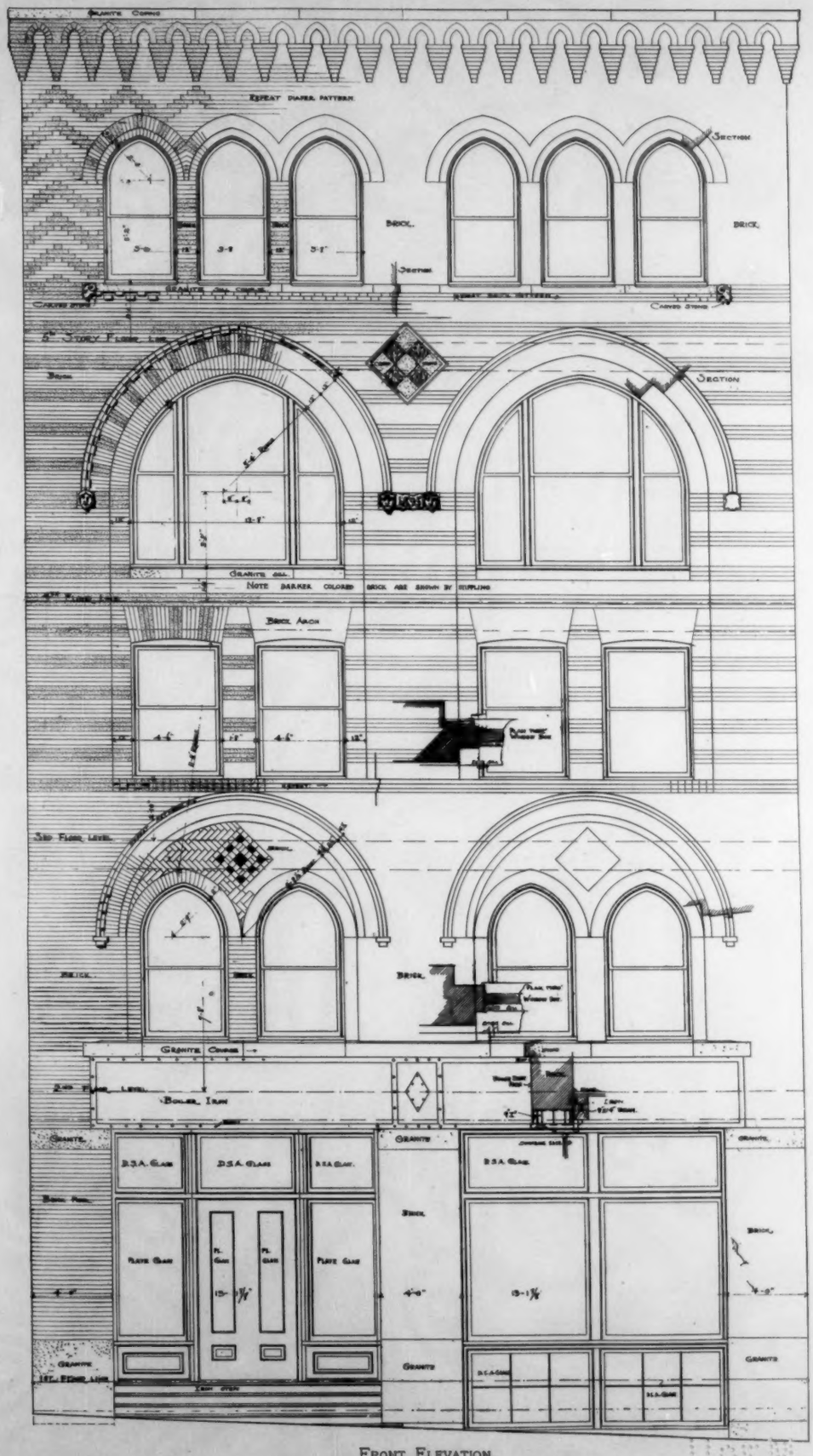
FRONT ELEVATION

WAREHOUSE BUILDING FOR T. L. BLOOD & CO. ST. PAUL MINN.

CASS GILBERT ARCHITECT
ST PAUL MINNESOTA

SCALE ⅛ INCH = 1 FOOT

BOSTON NORTHWEST REALESTATE CO OWNERS.



FRONT ELEVATION.

BUSINESS BLOCK, ST. PAUL, MINN.

CASS GILBERT, ARCHITECT.

THE DELMONICO BUILDING, 44TH STREET AND FIFTH AVE., NEW YORK CITY.
JAMES BROWN LORD, ARCHITECT

TERRA-COTTA AND BRICK BY THE

NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY,

PHILADELPHIA. 38 PARK ROW, NEW YORK CITY. BOSTON.